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THE TRANSACTIONS

OF THE

EDINBURGH OBSTETRICAL SOCIETY.

VOL. XXI.

SESSION 1895-96.

WITH GENERAL INDEX TO VOLS. I. TO XXI.

EDINBURGH: OLIVER AND BOYD,
PUBLISHERS TO THE SOCIETY.
1896.

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PREFACE.

THIS, the twenty-first volume of the Society's Transactions, contains a record of its proceedings during the Session 1895–96.

In it, as in former volumes, the views brought forward in the papers are to be considered as those of the writers themselves, and not as those of the Society as a body.

A general Index to the Transactions has been prepared, and is included in the present volume.

THE EDITOR.

October 1896.

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John W. Ballantyne, M.D., F.R.C.P. Ed., ... 1896

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1886 Chiara, Prof., Domenico, Florence.

1882 Emmet, Dr, 93 Madison Avenue, New York.

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1891 Gusserow, Prof., Charité, Berlin.

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1882 Hegar, Professor, Albert Ludwig's University, Freiburg.

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1892 Koeberlé, Dr Eugene, Strassburg.

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1895 Martin, Professor Dr A., N. Elsasserstrasse 85, Berlin.

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1851 Oldham, Dr Henry, Marufa, Boscombe, Bournemouth.

1889 Olshausen, Professor, Frauenklinik, Artillerie Strasse 13, Berlin.

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1882 Stadtfeldt, Professor, Copenhagen.

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	W. Fraser Macdonald, M.B., C.M., *Auchtermuchty*,	1884
115	William Spence, M.B., C.M., *Dollar*,	1884
	Alexander Thom, M.D., C.M., *Crieff*,	1884
	William Wright Millard, M.B., C.M.,	1884
	John Mowat, M.D., C.M.,	1884
	William John Beattie, L.R.C.P. Ed., L.F.P. & S. Glasg., *Stockton-on-Tees*,	1884
120	James Lumsden Bell, M.B., C.M., *Driffield, Yorkshire*,	1884
	Thomas Brown Darling, M.D., C.M.,	1884
	Harry Melville Dunlop, M.D., F.R.C.P. Ed.,	1884
	*Robert William Felkin, M.D.,	1884
	James K. King, M.D., *Watkins, New York*,	1884
125	William Marshall, L.R.C.S. Ed., *Milnathort*,	1884
	William Richardson, M.D., F.R.C.S. Ed., *Bristol*,	1884
	Fourness Barrington, M.B., F.R.C.S. Eng., *London*,	1884
	Francis William Nicol Haultain, M.D., F.R.C.P. Ed.,	1884
	*John Struthers Stewart, L.R.C.P. & S. Ed.,	1884
130	W. G. Anglin, M.D., C.M., *Kingston, Ontario*,	1885
	Alexander Campbell, M.D., F.R.C.S. Ed., *Dundee*,	1885
	Charles Batten Gracie, L.R.C.P. Ed., M.R.C.S. Eng., *Burntisland*,	1885
	Frederick Anastasius Saunders, F.R.C.S. Ed., L.R.C.P. Ed., *Grahamstown, South Africa*,	1885
	John Smith, M.D., M.R.C.S. Eng., *Kirkcaldy*,	1885
135	Allan Cuthbertson Sym, M.D., C.M.,	1885
	Frederick J. Underhill, F.R.C.S. Ed., L.R.C.P. Ed., *British Columbia*,	1885
	William Gayton, M.D., M.R.C.P.L., M.R.C.S. Eng., *London*,	1885
	*Alexander Matthew, F.R.C.S. Ed., *Corstorphine*,	1885
	Thomas Cargill Nesham, M.D., M.R.C.S. Eng., *Newcastle-on-Tyne*,	1885
140	Alexander Somerville Cumming, M.D., F.R.C.P. Ed.,	1885
	Gustave Michael, M.B., C.M., *London*,	1885
	James Mills, M.D., *Janesville, Wisconsin, U.S.A.*,	1885
	Selwyn Hale Puckle, M.B., C.M., *Bishop's Castle, Shropshire*,	1885
	*James Haig Ferguson, M.D., F.R.C.P. Ed., M.R.C.S. Eng.,	1885
145	John Edward Gemmell, M.B., C.M., *Liverpool*,	1885
	Robert Stewart, M.B., C.M.,	1885
	Surgeon-Captain Robert Charles Macwatt, M.B., C.M., 15th Bengal Cavalry, *Bombay*,	1885
	*E. H. Lawrence Oliphant, M.D., C.M., *Glasgow*,	1885
	Andrew Wallace Walker, L.R.C.P. Ed., L.F.P. & S. Glasg.,	1886
150	James Hogarth Pringle, M.B., F.R.C.S. Eng., *Glasgow*,	1886
	Walter Blake Nisbet, M.B., C.M., *N. Queensland*,	1886
	Hugo Macaulay Hardcastle, M.D., C.M., *Newcastle on-Tyne*,	1886
	Robert Swan Aitchison, M.D., F.R.C.P. Ed.,	1886
	Alfred Aikman, M.B., C.M., *Hull*,	1886
155	John Walton Hamp, L.F.P. & S. Glasg., L.S.A., *Wolverhampton*,	1886
	John Dickinson Leigh, M.B., C.M., *Brotton, Yorkshire*,	1886
	James Auriol Armitage, M.D., C.M., *Wolverhampton*,	1886
	William Henry Miller, M.D., F.R.C.P. Ed.,	1886
	John M'Call, L.R.C.P. Ed.,	1886
160	Thomas Wood, M.B., C.M.,	1886
	F. E. Drumheller, M.D., *Sunbury, Pennsylvania*,	1887
	F. W. D'Evelyn, M.B., C.M., *San Francisco*,	1887
	Alexander Forbes, M.B., C.M., *Liberton*,	1887
	Hugh M'Callum, L.R.C.P. & S. Ed., *Fitlochry*,	1887
165	Nutting Stuart Fraser, M.B., M.R.C.S. Eng., *St John's, Newfoundland*,	1887

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	George Franklin Shiels, M.D., F.R.C.S. Ed., *San Francisco*,	1887
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	Augustus Alexander Matheson, M.D., F.R.C.P. Ed.,	1887
	Robert Mackenzie, M.D., C.M.,	1887
170	Simon Linton, M.B., C.M., *Grangemouth*,	1887
	Henry Spelman Baumgartner, M.B., M.R.C.S. Eng., *Newcastle-on-Tyne*,	1887
	Thomas Jackson Thyne, M.B., F.R.C.P. Ed.,	1887
	W. Burns Macdonald, M.B., C.M., *Dunbar*,	1887
	Charles William J. Chepmell, M.D., L.R.C.P. & S. Ed., *Brighton*,	1887
175	John St Clair Boyd, M.D., M.Ch., *Belfast*,	1887
	Briton Smallman Robson, M.B., C.M., *Newcastle-on-Tyne*,	1887
	Ernest T. Roberton, M.D., M.R.C.S. Eng., *New Zealand*,	1887
	*Samuel Sloan, M.D., F.F.P. & S. Glasg., *Glasgow*,	1887
	James Wm. Fox, L.R.C.P. & S. Ed., *London*,	1887
180	John Frederick Sturrock, M.B., C.M., *Broughty-Ferry*,	1887
	Alexander Primrose, M.B., M.R.C.S. Eng., *Toronto, Canada*,	1887
	Arthur Perigal, M.D., M.R.C.S. Eng., *New Barnet, Herts*,	1887
	James Aitken Clark, M.B., C.M.,	1887
	Edward Carmichael, M.D., F.R.C.P. Ed.,	1887
185	Percival Humble Watson, M.R.C.S. Eng., L.R.C.P. Ed., *Newcastle-on-Tyne*,	1887
	Charles Clark Teacher, M.B., C.M.,	1887
	Robert Inch, M.B., C.M., *Gorebridge*,	1887
	Ellis Thomas Davies, M.D., M.R.C.S. Eng., *Liverpool*,	1887
	Henry Alexis Thomson, M.D., F.R.C.S. Ed.,	1887
190	John Orr, M.B., C.M., *Manchester*,	1887
	George Owen Carr Mackness, M.D., C.M., *Broughty-Ferry*,	1887
	Francis Joseph Baildon, M.B., C.M., *Southport*,	1887
	Surgeon-Lt. Ralph H. Maddox, M.B., M.R.C.S. Eng., I.M.S., *Bombay*,	1887
	James Williamson Martin, M.D., F.R.C.P. Ed.,	1887
195	James Andrew Blair, M.B., C.M., D.Sc., *Straiton, Maybole*,	1887
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	*John Thomson, M.D., F.R.C.P. Ed.,	1887
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	William M'Creadie, M.B., M.R.C.P. Ed.,	1887
200	Robert Kirk, M.D., F.R.C.S. Ed., *Bathgate*,	1887
	William Fraser Wright, M.B., C.M., *Leith*,	1887
	Alexander Bruce, M.D., F.R.C.P. Ed.,	1887
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205	James Hutcheson, M.D., F.R.C.S. Ed.,	1888
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	Christopher Martin, M.B., F.R.C.S. Eng., *Birmingham*,	1888
	John George Havelock, M.D., C.M., *Montrose*,	1888
	John Pirie, M.B., C.M.,	1888
210	John Gibson Graham, M.B., C.M., *Glasgow*,	1888
	William Augustus Gibson, L.R.C.P. & S. Ed., *London*,	1888
	Robert Adams Brewis, M.D., C.M., *Waratah, Tasmania*,	1888
	John Allison, M.D., C.M., *Kettering, Northampton*,	1888
	Surgeon-Captain Charles H. Bedford, M.D., D.Sc., M.R.C.S. Eng., Bengal Army, *Bombay*,	1888
215	Archibald Cowan Guthrie, M.B., C.M.,	1888
	John Cunninghame, M.B., C.M., *New Zealand*,	1888
	Samuel Beatty, M.B., C.M., *Pitlochry*,	1888
	Professor James Chalmers Cameron, M.D., *Montreal*,	1888
	Archibald Home Douglas, M.B., F.R.C.P. Ed., *Nice*,	1888
220	Albert Edward Morison, M.B., F.R.C.S. Ed., M.R.C.S. Eng., *Hartlepool*,	1888
	George H. Temple, M.B., C.M., *Weston-super-Mare*,	1888
	Norman L. Boxill, M.B., C.M., *Barbados*,	1888

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	Khumar B. Narayan, L.R.C.P. & S. Ed., *Cooch Behar, India*,	1888
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225	William Lundie, M.D., C.M.,	1888
	George Scott MacGregor, M.B., C.M., *Glasgow*,	1888
	William Sneddon, M.B., C.M., *Cupar-Fife*,	1888
	Thomas Watts Eden, M.B., C.M., *London*,	1888
	William Fordyce, M.D., C.M.,	1888
230	Charles E. Harvey, M.B., M.R.C.S. Eng., *Sav-la-Mar, Jamaica*,	1889
	Frederick E. Welby, F.R.C.S.E., *St Helena*,	1889
	Alexander Lang Murray, L.R.C.P. & S. Ed.,	1889
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	James F. W. Ross, M.D., *Toronto, Canada*,	1889
235	J. Stuart Nairne, F.R.C.S. Ed., F.F.P. & S. Glasg., *Glasgow*,	1889
	John David Williams, M.D., C.M., *Cardiff*,	1889
	James S. Fox, M.B., M.R.C.S. Eng., *St Helens*,	1889
	S. M'Murtry, M.D., *Louisville, Kentucky, U.S.A.*,	1889
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240	Thomas Wm. Nassau Greene, L.R.C.P. Ed., L.R.C.S.I., *London*,	1889
	John Clarence Webster, M.D., F.R.C.P. Ed., *London*,	1889
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	William Basil Orr, M.D., C.M.,	1889
245	Frederick Mann, M.B., C.M., *Ashton-on-Lyne*,	1889
	Edward Farr Armour, M.B., C.M.,	1889
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255	Walter Scott Gibson, M.B., C.M., *London*,	1890
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	Alexander William Gordon Price, M.B., C.M.,	1890
	Hugh Shapter Robinson, M.R.C.S. Eng., L.R.C.P. Ed., *London*,	1890
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260	Frederick Albert Lawton Lockhart, M.B., C.M., *Montreal, Canada*,	1890
	Edmund Frederick Tanney Price, M.B., C.M.,	1890
	George Lovell Gulland, M.D., F.R.C.P. Ed.,	1890
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265	James Duncan Farquharson, M.B., C.M., *Newcastle-on-Tyne*,	1890
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270	William Russell, M.D., F.R.C.P. Ed.,	1890
	William Paterson, M.B., C.M., *Glasgow*,	1890
	Alexander Scott Duncan, M.B., C.M., *London*,	1890
	Prof. William Keiller, F.R.C.S. Ed., *Galveston, Texas, U.S.A.*,	1890
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275	Gains T. Smith, M.D., *Moncton, New Brunswick*,	1891
	John Hugh Alexander Laing, M.B., C.M.,	1891
	Robert Thin, M.B., F.R.C.P. Ed.,	1891
	Charles Edward Lester, L.R.C.P. & S. Ed., *Australia*,	1891
	Thomas Lawson, M.B., C.M.,	1891
280	Alexander H. Vassie, M.B., C.M., *Kirkcaldy*,	1891
	James Harvey, M.B., C.M.,	1891
	Alexander Henderson, M.B., C.M.,	1891

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	James Smith, M.B., C.M.,	1891
	C. Carty Salmon, L.R.C.P. & S. Ed., *Melbourne, Australia,*	1891
285	George Balfour Marshall, M.D., C.M., *Glasgow,*	1891
	Edward Henry Alexander, M.B., M.R.C.S. Eng., *New Zealand,*	1891
	William Booth, F.R.C.S. Ed.,	1891
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	Richard T. Yoe, M.D., *Louisville, Kentucky, U.S.A.,*	1891
290	Alexander Bruce Giles, M.D., C.M.,	1891
	James Y. Simpson Young, M.B., C.M.,	1891
	Alexander Charles Harkness, L.R.C.P. & S. Ed., *Market Drayton,*	1891
	Alexander Jacobus van Niekerk, M.B., C.M., *Johannesburg, South Africa,*	1891
	Hamilton G. Langwill, M.B., M.R.C.P. Ed., *Leith,*	1891
295	Herbert Ernest Lee, M.B., C.M., *Australia,*	1891
	Charles Martin, M.B., C.M., *Birmingham,*	1892
	William Murray Cairns, M.B., C.M., *Liverpool,*	1892
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300	James Thomas Moore Giffen, F.R.C.S. Ed., *Chester,*	1892
	John Alexander Robertson, M.B., C.M., *Cape Town,*	1892
	Frank Dendle, M.B., C.M., *Lochgelly,*	1892
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	Frederick Thomas Anderson, M.D., F.R.C.S. Ed.,	1892
305	J. Gordon Smith, L.R.C.P. & S. Ed., *West Africa,*	1892
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	Hugh Ernest Fraser, M.B., C.M., *Inverness,*	1892
	John Alexander Campbell Kynoch, M.B., M.R.C.P. Ed., *Dundee,*	1892
	Alexander Brown Ritchie, M.B., C.M., *Hulme, Manchester,*	1892
310	Walter John Shaw, M.B., C.M., *Cockburnspath,*	1892
	Robert Stirling, M.D., C.M., *Perth,*	1892
	William Henry Vickery, F.R.C.S. Eng., L.R.C.P. Lond., *Newcastle-on-Tyne,*	1892
	George Foggin, L.R.C.P. & S. Ed., *Newcastle-on-Tyne,*	1892
	William Ramsay Smith, M.B., C.M., *Australia,*	1892
315	James Cecil Palmer, M.B., F.R.C.S. Ed., *New Zealand,*	1892
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	Charles Frederick Ponder, M.B., C.M., *Darjeeling, India,*	1892
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	Richard J. Erskine Young, M.D., C.M.,	1892
320	George Thomas Cooke Adams, L.R.C.P. & S. Ed., *Melbourne, Australia,*	1892
	George Henry Walter Smith, M.D., C.M., *Sydney, Australia,*	1892
	John Lawson Dick, M.B., C.M., *Liverpool,*	1892
	Charles Croomhall Easterbrook, M.B., C.M.,	1892
	Walter Petrie Simpson, M.B., C.M., *Lincolnshire,*	1892
325	James Ernest Moorhouse, M.D., C.M., *Stirling,*	1892
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	D. W. Johnston, F.R.C.S. Ed., *Johannesburg, South Africa,*	1892
	David George Davidson, M.B., C.M.,	1892
	Robert M'Dowall Brown, M.B., C.M., *Denholm,*	1892
330	Allen Thomson Sloan, M.D., C.M.,	1893
	Robert Balfour Graham, F.R.C.S. Ed., *Leven, Fife,*	1893
	Albert Frederick Rosa, M.B., C.M.,	1893
	George Benjamin Mitchell, M.B., C.M., *Whitby,*	1893
	Isaac Wood, M.D., *Kingston, Ontario, Canada,*	1893
335	Andrew Walker, M.D., C.M., *Sheffield,*	1893
	H. Robins, M.D., *Jamaica,*	1893
	F. L. Burdon, M.D., *New Baltimore, Michigan,*	1893
	L. J. Schofield, M.D., *Warrensburg, Mo., U.S.A.,*	1893
	David Milligan, M.B., C.M.,	1893
340	John Howard-Jones, M.B., C.M., D.Sc., *Newport, Mon.,*	1893

		Date of Admission.
	George Morton Wilcockson, L.R.C.P. & S. Ed., *Reading*,	1893
	Albert Franklin M'Vety, M.D., M.R.C.S. Eng., *Toledo, Ohio*,	1893
	John MacRae, M.D., C.M., *Murrayfield*,	1893
	Ernest Switzer Forde, L.R.C.P. & S. Ed., *Derby*,	1893
345	George Wade, M.D., C.M., *Melrose*,	1893
	Philip Grierson Borrowman, M.B., C.M., *Elie, Fife*,	1893
	Thomas Finlayson Macdonald, M.B., C.M., *Dumfries*,	1893
	John Liddell, M.D., C.M., *Harrogate*,	1893
	W. Herbert Gregory, M.B., *Beverley, Yorks*,	1893
350	Ernest Coleman Moore, M.B., C.M.,	1893
	Cuthbert Christy, M.B., C.M., *Broomfield*,	1893
	Robert Hutchison, M.D., M.R.C.P. Ed.,	1893
	James Gibson Cattanach, M.B., C.M.,	1893
	George Elder, M.D., M.R.C.P. Ed.,	1893
355	Alexander Maitland Easterbrook, M.B., C.M., *Gorebridge*,	1893
	W. H. M'Kenley, M.D., *New York*,	1893
	Robert William Roberts, L.R.C.P. & S. Ed., *South Wales*,	1894
	Claude Buchanan Ker, M.D., C.M.,	1894
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360	Charles Alexander Butchart, M.B., C.M.,	1894
	Frederick Maurice Graham, L.R.C.P. & S. Ed., *India*,	1894
	Robert Hoggan, M.B., C.M., *Liberton*,	1894
	James Livingstone Thompson, M.B., C.M., *Australia*,	1894
	George Stevenson Shirt Hirst, M.B., C.M., *Hinckley*,	1894
365	John Stevens, M.D., F.R.C.P. Ed.,	1894
	Charles Isodon Bodon, M.D., *Budapest*,	1894
	Hugh Lewis Hughes, L.R.C.P. & S. Ed., *Dowlais*,	1894
	Sylvanus Glanville Morris, M.D., C.M., *Nantgaredig*,	1894
	Georges P. Coromilas, M.D., *Calamata, Greece*,	1894
370	Thomas Easton, M.D., C.M., *Stranraer*,	1894
	David Robertson Dobie, M.D., C.M., *Coldstream*,	1894
	Gopal Govind Vatve, M.D., *Bombay*,	1894
	Robert William Beesley, M.B., C.M., *Bolton*,	1894
	William A. Stephen, M.B., C.M., *Loftus-in-Cleveland*,	1894
375	William Edward Fothergill, M.B., C.M., *Manchester*,	1894
	George Sandison Brock, M.D., C.M., *Rome*,	1894
	Frederick William Mackay, M.D., C.M.,	1894
	John M. Munro Kerr, M.B., C.M., *Glasgow*,	1894
	John Montgomery, M.B., C.M., *Birmingham*,	1895
380	Robert Cochrane Buist, M.D., C.M., *Dundee*,	1895
	Robert Thomson Ferguson, M.B., C.M., *Anstruther*,	1895
	A. Kennedy Melville, M.D., F.R.C.S. Ed.,	1895
	William Henry Stephenson, L.R.C.P. & S. Ed., L.F.P. & S. Glasg., *Manchester*,	1895
	Angus Vallance MacGregor, M.B., C.M., *Hartlepool*,	1895
385	Charles William Donald, M.B., C.M.,	1895
	Oguntola Sapara, L.R.C.P. & S. Ed., *Lagos, W. Africa*,	1895
	John Struthers, M.B., C.M., *Transkei, South Africa*,	1895
	B. W. Broad, M.B., C.M., *Cardiff*,	1895
	Edwin Hindmarsh, M.B., C.M., *Bengal*,	1895
390	Patrick Mackin, L.R.C.P. & S. Ed., *New Zealand*,	1895
	G. Edgar Helme, M.B., C.M., *Manchester*,	1895
	Percy T. Hughes, M.B., C.M., *Darlington*,	1895
	John Hossack Fraser, M.B., M.R.C.P. Ed., *Bridge of Allan*,	1895
	Stewart Grant Ogilvy, M.B., C.M.,	1895
395	T. Johnson-Alloway, M.D., *Montreal*,	1895
	Thomas Howard Morgan, M.D., F.R.C.S. Ed., *Birmingham*,	1895
	William Macrae Taylor, M.B., C.M.,	1895
	David James Graham, M.B., C.M.,	1895
	Walter William Chipman, M.B., C.M.,	1895
400	Oswald Hanson Isard, M.B., C.M., *London*,	1896
	John Cumming, L.R.C.P. & S. Ed.,	1896

		Date of Admission.
	Sol Jervois Aarons, M.B., C.M.,	1896
	Robert Beveridge, M.B., C.M., *Leith*,	1896
	John Anderson, M.B., C.M., *Pitlochry*,	1896
	Thomas John Burton, M.D., C.M., *Helensburgh*,	1896
406	Robert M. Leith, M.B., C.M., *Cape Colony*,	1896

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	Barbour, Dr A. H. Freeland, 4 Charlotte Square,	1879
	Craig, Dr William, 71 Bruntsfield Place,	1870
	Croom, Dr J. Halliday, 25 Charlotte Square,	1870
5	Cumming, Dr John, 94 Gilmore Place,	1896
	Hart, Dr D. Berry, 29 Charlotte Square,	1877
	Johnston, Dr D. W, P.O. Box 2022, Johannesburg, South African Republic,	1892
	Ponder, Dr Charles F., Guild Mission House, Kalimpong, Darjeeling, India,	1892
	Ross, Dr James F. W., 481 Sherbourne Street, Toronto, Canada,	1889
10	Simpson, Professor A. R., 52 Queen Street,	1858
	Struthers, Dr John, Nqamakwe, Transkei, South Africa,	1895
	Vatve, Dr Gopal Govind, care of H.H. The Rajah of Miraj, Bombay, India,	1894

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15	Adams, Dr George T. Cooke, 32 Collins Street, Melbourne, Victoria, Australia,	1892
	Affleck, Dr J. O., 38 Heriot Row,	1869
	Aikman, Dr Alfred, The Elms, Beverley Road, Hull,	1886
	Aitchison, Dr R. S., 74 Great King Street,	1886
	Alexander, Dr E. H., Albert Street, Dunedin, New Zealand,	1891
20	Alexander, Dr W. B., 8 Blenheim Place,	1882
	Allison, Dr J., Fuller House, Kettering, Northampton,	1888
	Anderson, Dr Fred. T., 20 Inverleith Row,	1892
	Andrew, Dr James, 2 Atholl Crescent,	1868
	Anglin, Dr W. G., 52 Earl Street, Kingston, Ontario,	1885
25	Archibald, Dr J., 2 The Avenue, Beckenham, Kent,	1877
	Armitage, Dr J. A., 28 Waterloo Road South, Wolverhampton,	1886
	Armour, Dr E. F., 149 Bruntsfield Place,	1889
	Badger, Dr W., Penicuik,	1880
	Baildon, Dr F. J., 57 Hoghton Street, Southport,	1887
30	Balfour, Dr Andrew, 12 Abercorn Terrace, Portobello,	1877
	Balfour, Dr G. W., 17 Walker Street,	1847
	Balfour, Dr J. Craig, 17 Walker Street,	1884
	Ballantyne, Dr A., Dalkeith,	1870
	Ballantyne, Dr J. W., 24 Melville Street,	1883
35	Barrington, Dr Fourness, care of Commercial Banking Company of Sydney, 18 Birchin Lane, London, E.C.,	1884
	Baumgartner, Dr H. S., Saville Place, Newcastle-on-Tyne,	1887
	Beatty, Dr Samuel, Pitlochry,	1888
	Beatty, Dr W. J., Stockton-on-Tees,	1884

		Date of Admission
	Bedford, Surgeon-Captain Charles H., M.D., D.Sc., M.R.C.S. Eng., H.M. Indian Medical Service, care of W. Watson & Co., 28 Apollo Street, Bombay,	1888
40	Beesley, Dr R. W., Infirmary and Dispensary, Bolton,	1894
	Beilby, Dr Julius H., 10 Clarendon Crescent,	1892
	Bell, Dr James L., Driffield, Yorkshire,	1884
	Bell, Dr Robert, 29 Lynedoch Street, Glasgow, W.,	1878
	Bentley, Dr G. H., Kirkliston,	1877
45	Beveridge, Dr Robert, 9 James Place, Leith,	1896
	Black, Dr Alexander, 13 Howe Street,	1881
	Black, Dr J. Watt, 15 Clarges Street, Piccadilly, London, W.,	1863
	Blaikie, Dr R. H , 42 Minto Street,	1888
	Blair, Dr J. A., Straiton Manse, Maybole,	1887
50	Bleloch, Dr A., 2 Lonsdale Terrace,	1876
	Boddie, Dr G. P., 147 Bruntsfield Place,	1889
	Bodon, Dr C. I., Király-utca 76, Budapest, Hungary,	1894
	Booth, Dr William, 1 Minto Street,	1891
	Borrowman, Dr Philip G., Elie, Fife,	1893
55	Boxill, Dr N. L., Buttalls, St George, Barbados,	1888
	Boyd, Dr J. St Clair, 27 Victoria Place, Belfast,	1887
	Brewis, Dr N. T., 23 Rutland Street,	1883
	Brewis, Dr R. A., Waratah, Tasmania,	1888
	Broad, Dr B. W., The Sanitorium, Cardiff,	1895
60	Brock, Dr G. Sandison, 47 Piazza Barberini, Rome,	1894
	Brodie, Dr W. Haig, Battle, Sussex,	1881
	Brown, Dr R. M., Denholm, by Hawick,	1892
	Bruce, Dr Alexander, 13 Alva Street,	1887
	Buist, Dr J. W., 1 Clifton Terrace,	1877
65	Buist, Dr R. C., Annfield House, Dundee,	1895
	Burdon, Dr F. L., New Baltimore, Michigan, U.S.A.,	1893
	Burton, Dr Thomas J., Locksley, Helensburgh,	1896
	Butchart, Dr C. A., 26 Leith Walk,	1894
	Cairns, Dr W. Murray, 67 Catherine Street, Liverpool,	1892
70	Calder, Dr H. L., 60 Leith Walk,	1882
	Cameron, Prof. James C., M.D., 941 Dorchester St., Montreal,	1888
	Campbell, Dr Alexander, 1 Clarendon Terrace, Dundee,	1885
	Cappie, Dr James, 37 Lauriston Place,	1862
	Carmichael, Dr Edward, 21 Abercromby Place,	1887
75	Carmichael, Dr James, 22 Northumberland Street,	1871
	Cattanach, Dr J. G., 3 Alvanley Terrace,	1893
	Chepmell, Dr Charles, 74 Dyke Road, Brighton,	1887
	Chipman, Dr W. W., University Union, Park Place,	1895
	Christy, Dr Cuthbert, Pryors, Broomfield, near Chelmsford,	1893
80	Church, Dr H. M., 36 George Square,	1875
	Clark, Dr J. A., 4 Cambridge Street,	1887
	Cobbett, Dr C. N., 29 Rosslyn Hill, Hampstead, London, N.W.,	1890
	Connel, Dr J., Peebles,	1869
	Coromilas, Dr Georges P., Calamata, Greece,	1894
85	Cox, Dr Joshua J., St Ronan's, Eccles, Manchester,	1876
	Croudace, Dr J. H., 23 Marston Road, Stafford,	1878
	Cullen, Dr G. M., 48 Lauriston Place,	1890
	Cumming, Dr A. S., 18 Ainslie Place.	1885
	Cunninghame, Dr John, Port Chalmers, New Zealand,	1888
90	Currie, Dr A. S., 81 Queen's Road, Finsbury Park, London, N.,	1882
	Darling, Dr T. Brown, 13 Merchiston Place,	1884
	Davidson, Dr D. G., 18 Granville Terrace,	1892
	Davies, Dr E. T., 97 Shaw Street, Liverpool,	1887
	Dendle, Dr Frank, Lochgelly, Fife,	1892
95	D'Evelyn, Dr F. W., 219 Geary Street, San Francisco,	1887
	Deverell, Dr H. C., 12 Windsor Street,	1882
	Dewar, Dr M., 24 Lauriston Place,	1891

		Date of Admission.
	Dick, Dr J. L., The Stanley Hospital, Stanley Road, Liverpool,	1892
	Dickson, Dr George, 9 India Street,	1867
100	Dobie, Dr D. R., Coldstream,	1894
	Donald, Dr C. W., Konsgarth, Braid Road,	1895
	Douglas, Dr A. Home, Rue Blacas, Nice, France,	1888
	Douglas, Dr Carstairs, 3 Eglinton Place, Skelmorlie, Ayrshire,	1890
	Drumheller, Dr F. E., 406 Market St., Sunbury, Pennsylvania,	1887
105	Dubourg, Dr J. R. H., 120 Islington, Liverpool,	1887
	Duncan, Dr A. J., Nethergate House, Nethergate, Dundee,	1879
	Duncan, Dr A. S., Eversley, Penge, London, S.E.,	1890
	Dunlop, Dr H. M., 20 Abercromby Place,	1884
	Dunsmure, Dr J., 53 Queen Street,	1876
110	Easterbrook, Dr A. M., Deanbank, Gorebridge,	1893
	Easterbrook, Dr C. C., Morningside Asylum,	1892
	Easton, Dr Thomas, Hanover House, Stranraer,	1894
	Eden, Dr T. Watts, 21 Bentick Street, Cavendish Square, London, W.,	1888
	Elder, Dr George, 7 Leopold Place,	1893
115	Elder, Dr W. Nicol, 6 Torphichen Street,	1879
	Evans, Dr O. F., 71 Mulgrave Street, Liverpool,	1890
	Farquharson, Dr J. D., 242 Westgate Road, Newcastle-on-Tyne,	1890
	Farquharson, Dr J. M., 2 Coates Place,	1894
	Felkin, Dr R. W., 8 Alva Street,	1884
120	Ferguson, Dr J. Haig, 25 Rutland Street,	1885
	Ferguson, Dr R. T., Anstruther, Fife,	1895
	Finlay, Dr W. A., St Helen's, Russell Place, Trinity,	1880
	Foggin, Dr George, 63 Westmorland Road, Newcastle-on-Tyne,	1892
	Forbes, Dr A., Liberton,	1887
125	Forde, Dr E. S., Dalry, Galloway,	1893
	Fordyce, Dr William, 20 Charlotte Square,	1888
	Fothergill, Dr W. E., 200 Oxford Road, Manchester,	1894
	Foulis, Dr James, 34 Heriot Row,	1878
	Fowler, Dr Simson C., Juniper Green,	1892
130	Fox, Dr James S., 6 Baldwin Street, St Helen's,	1889
	Fox, Dr J. W., 68 Lupus Street, S. Belgravia, London, S.W.,	1887
	Fraser, Dr F. W. Dyce, Gorton House, Lasswade,	1883
	Fraser, Dr H. E., 63 Church Street, Inverness,	1892
	Fraser, Dr J. Hossack, Bellfield, Bridge of Allan,	1895
135	Fraser, Dr J. Joynor, Hessle, East Yorks,	1880
	Fraser, Dr Nutting S., 205 Gower Street, St John's, Newfoundland,	1887
	Freeland, Dr Richard, Broxburn,	1879
	Gayton, Dr William, Bartram Lodge, Fleet Road, Hampstead, London, N.W.,	1885
	Gemmell, Dr J. E., 12 Rodney Street, Liverpool,	1885
140	Gibson, Dr W. A., 3 Overstrand Mansions, Battersea Park, London, S.W.,	1888
	Gibson, Dr W. Scott, 34 Dulwich Road, Herne Hill, London, S.E.,	1890
	Giffen, Dr J. J. M., 129 Boughton, Chester,	1892
	Giles, Dr A. B., 1 Kew Terrace,	1891
	Gilmour, Dr T. F., Port Ellen, Islay,	1882
145	Glaister, Dr John, 4 Grafton Place, Grafton Square, Glasgow,	1879
	Gracie, Dr C. B., Buccleuch Villa, Burntisland,	1885
	Graham, Dr D. J., Chalmers' Hospital, Lauriston Place,	1895
	Graham, Dr F. M., Elysium Hotel, Simla, India,	1894
	Graham, Dr J. Gibson, 5 Ashgrove Ter., Partickhill, Glasgow,	1888
150	Graham, Dr R. Balfour, Leven, Fife,	1893
	Grasett, Dr F. L., 208 Simcoe Street, Toronto, Canada,	1877
	Gray, Dr H. St Clair, 15 Newton Terrace, Glasgow,	1891
	Greene, Dr J. W. N., Beaumont House, Church Road, Forest Hill, London, S.E.,	1889

		Date of Admission.
	Gregory, Dr W. H., North Bar Street, Beverley, Yorks,	1893
155	Gulland, Dr G. L., 6 Alva Street,	1890
	Guthrie, Dr A. Cowan, 171 Constitution Street, Leith,	1888
	Hamilton, Dr J. R., Hawick,	1879
	Hamp, Dr J. Walton, Penn Road, Wolverhampton,	1886
	Hardcastle, Dr H. M., Archbold Lodge, Newcastle-on-Tyne,	1886
160	Hardie, Dr Thomas, 10 John's Place, Leith,	1870
	Harkness, Dr A. C., Willoughbridge, Market Drayton, Salop,	1891
	Harvey, Dr Charles G., Kingswood, Sav-la-Mar, Jamaica, W.I.,	1889
	Harvey, Dr James, 7 Blenheim Place,	1891
	Haultain, Dr F. W. N., 17 Rutland Street,	1884
165	Havelock, Dr J. G., Sunnyside, Montrose,	1888
	Hay, Dr Henry, 7 Brandon Street,	1879
	Helm, Dr J. H., Ratho,	1888
	Helm, Dr R. Dundas, 3 Alfred Street N., Portland Sq., Carlisle,	1892
	Helme, Dr G. Edgar, Gloucester House, Rusholme, Manchester,	1895
170	Henderson, Dr Alexander, 21 Pitt Street,	1891
	Henderson, Dr John, 7 John's Place, Leith,	1857
	Hewetson, Dr J., Holmfield, Reigate,	1881
	Hindmarsh, Dr Edwin, Mozufferpore, Tirhoot State Railway, Bengal, India,	1895
	Hirst, Dr George S. S., Wolvey Abbey, Hinckley, Leicestershire,	1894
175	Hoggan, Dr R., Constanceville, Liberton,	1894
	Hooper, Dr J. W. D., Lying-in Hospital, Melbourne, Australia,	1884
	Howard-Jones, Dr J., Town Hall, Newport, Mon.,	1893
	Hughes, Dr H. L., Gwernllwyn House, Dowlais, Glamorganshire,	1894
	Hughes, Dr P. T., Holy Trinity Vicarage, Darlington,	1895
180	Hunter, Dr George, 33 Palmerston Place,	1881
	Hurst, Dr George, Scott Chambers, 96 Pitt St., Sydney, N.S.W.,	1881
	Husband, Dr William, 4 Royal Circus,	1857
	Hutcheson, Dr J., 44 Moray Place,	1888
	Hutchison, Dr Robert, 18 Albany Street,	1893
185	Hyslop, Dr J. M'A., 22 Palmerston Place,	1874
	Inch, Dr Robert, Gorebridge,	1887
	Isard, Dr O. H., Docharn, Elmbourne Road, Upper Tooting, London, S.W.,	1896
	Jamieson, Dr Hugh, 13 Lauriston Place,	1889
	Jamieson, Dr James, 43 George Square,	1866
190	Johnson-Alloway, Dr T., 23 Mackay Street, Montreal,	1895
	Johnston, Dr William, Stirling,	1871
	Keiller, Dr A. J., North Berwick,	1889
	Keiller, Prof. Wm., 1523 Thirty-first Street, Galveston, Texas, U.S.A.,	1890
	Ker, Dr C. B., City Fever Hospital,	1894
195	Kerr, Dr J. M. Munro, 28 Berkeley Terrace, Glasgow,	1894
	King, Dr J. K., The Glen Springs Sanitorium, Watkins, New York, U.S.A.,	1884
	Kirk, Dr Robert, Bathgate,	1887
	Kynoch, Dr Campbell, 8 Airlie Place, Dundee,	1892
	Lackie, Dr James, 2 Randolph Place,	1889
200	Laing, Dr J. H. A., 11 Melville Street,	1891
	Langwell, Dr H. G., 49 Charlotte Street, Leith,	1891
	Lawson, Dr Thomas, 16 Dean Terrace,	1891
	Lee, Dr Herbert E., Gunnedah, N.S.W., Australia,	1892
	Leigh, Dr J. Dickinson, The White House, Brotton, Yorkshire,	1886
205	Leith, Dr Robert M., Somerset East, Cape Colony, South Africa,	1896
	Lester, Dr Charles E., Mudgee, N.S.W., Australia,	1891
	Liddell, Dr J., North View, Victoria Avenue, Harrogate,	1893
	Linton, Dr John, 60 George Square,	1863
	Linton, Dr Simon, Grangemouth,	1887
210	Little, Dr W. C., Warracknabeal, Victoria, Australia,	1889

		Date of Admission.
	Littlejohn, Dr Harvey, 6 Clarke Grove, Sheffield,	1890
	Lockhart, Dr F. A. L., 38 Bishop Street, Montreal, Canada,	1890
	Lucas, Dr Robert, Dalkeith,	1871
	Lundie, Dr William, 3 Glengyle Terrace,	1888
215	Lyle, Dr F. W., 39 The Avenue, Castle Hill, Ealing, London, W.,	1890
	M'Call, Dr John, 4 Leopold Place,	1886
	M'Callum, Dr H., Pitlochry,	1887
	M'Creadie, Dr William, 164 Ferry Road,	1887
	Macdonald, Dr T. F., Crichton Royal Institution, Dumfries,	1893
220	Macdonald, Dr W. B., Port Lodge, Dunbar,	1887
	Macdonald, Dr W. Fraser, Auchtermuchty,	1884
	MacGregor, Dr A. V., The Hospital, Hartlepool,	1895
	Macgregor, Dr G. S., 2 Burnbank Terrace, Glasgow,	1888
	Mackay, Dr F. W., 5 Walker Street,	1894
225	Mackay, Dr George, 74 Bruntsfield Place,	1879
	M'Kenley, Dr W. H., 137 West 26th Street, New York,	1893
	Mackenzie, Dr R., Napier Villa, 2 Morningside Road,	1887
	Mackin, Dr Patrick, Wellington, New Zealand,	1895
	MacLachlan, Dr A., Beauly,	1887
230	M'Lean, Dr Archibald, Crosshouse, Kilmarnock,	1890
	M'Murtry, Dr L. S., 231 West Chesnut Street, Louisville, Kentucky, U.S.A.,	1889
	M'Nab, Dr John, Bunessan, Oban,	1873
	Mackness, Dr G. O. C., Fort Street House, Broughty-Ferry,	1887
	MacRae, Dr John, Lynwood, Murrayfield,	1893
235	M'Vety, Dr A. Franklin, 235 12th Bath Street, Toledo, Ohio,	1893
	Macvie, Dr S., Chirnside,	1881
	M'Watt, Dr John, Morelands, Duns,	1879
	Macwatt, Dr R. C., 25 Rutland Square,	1885
	Maddox, Dr Ralph H., I.M.S., care of Messrs William Watson & Co., 28 Apollo Street, Bombay,	1887
240	Mann, Dr F. W., 266 Katherine Street, Ashton-under-Lyne,	1889
	Marshall, Dr G. Balfour, 11 Woodside Crescent, Glasgow,	1891
	Marshall, Dr William, Milnathort,	1884
	Martin, Dr Charles, 35 George Road, Edgbaston, Birmingham,	1892
	Martin, Dr Christopher, 35 George Rd., Edgbaston, Birmingham,	1888
245	Martin, Dr J. W.,	1887
	Matheson, Dr A. A., 41 George Square,	1887
	Matthew, Dr Alexander, Corstorphine,	1885
	Melville, Dr A. Kennedy, 35 Mayfield Gardens,	1895
	Menzies, Dr David, 20 Rutland Square,	1877
250	Messer, Dr Fordyce, Helensburgh,	1866
	Michael, Dr Gustave, 188 Commercial Road East, London, E.,	1885
	Millard, Dr W. W., 3 George Place,	1884
	Miller, Dr W. H., 51 Northumberland Street,	1886
	Milligan, Dr D., 11 Palmerston Place,	1893
255	Mills, Dr James, Janesville, Wisconsin, U.S.A.,	1885
	Mitchell, Dr G. B., 40 Baxtergate, Whitby,	1893
	Moir, Dr Alex., 30 Buccleuch Place,	1876
	Montgomery, Dr John, The Highlands, Balsall Heath, Birmingham,	1895
	Moore, Dr E. Coleman, 2 Coates Place,	1893
260	Moorhouse, Dr J. Ernest, 9 Victoria Square, Stirling,	1892
	More, Dr James, Rothwell, Kettering, Northampton,	1880
	Morgan, Dr T. H., 7 The Crescent, Birmingham,	1895
	Morison, Dr Albert E., Brougham Terrace, Hartlepool,	1888
	Morris, Dr S. Glanville, The Surgery, Nantgaredig, South Wales,	1894
265	Mowat, Dr John, 32 Buccleuch Place,	1884
	Munro, Dr A. Watson, 183 Liverpool Street, Sydney, Australia,	1892
	Murray, Dr A. Lang, 18 Duddingston Park, Portobello,	1889
	Murray, Dr D. R., 41 Albany Street, Leith,	1878

		Date of Admission.
	Murray, Dr James, 1 Brandon Street,	1879
270	Murray, Dr R. Milne, 11 Chester Street,	1880
	Nairne, Dr J. Stuart, 141 Hill Street, Garnethill, Glasgow,	1889
	Napier, Dr A. D. L., The General Hospital, Adelaide, South Australia,	1878
	Narayan, Mr Kumar B., Cooch Behar, India,	1888
	Nesham, Dr T. Cargill, 12 Ellison Place, Newcastle-on-Tyne,	1885
275	Niekerk, Dr Alexander van, Box 68, Johannesburg, S. African Republic,	1891
	Nisbet, Dr W. B., Townsville, N. Queensland, Australia,	1886
	Oakes, Dr Arthur, "Warialda," Portarlington Road, Bournemouth,	1879
	Ogilvy, Dr Stewart Grant, 12 Graham Street,	1895
	Oliphant, Dr E. H. Lawrence, 18 Burnbank Terrace, Glasgow,	1885
280	Orr, Dr John, Egerton Road, Monton, Manchester,	1887
	Orr, Dr W. Basil, 13 Braid Road,	1889
	Pairman, Dr T. Wyld, H.M. Prison, Lyttelton, New Zealand,	1883
	Palmer, Dr J. C., Christ Church, Canterbury, New Zealand,	1892
	Paterson, Dr G. Keppie, 17 Forth Street,	1882
285	Paterson, Dr William, Millbrae Road, Langside, Glasgow,	1890
	Peddie, Dr H. Anderson, 24 Palmerston Place,	1882
	Pereira, Dr A. A. Jervis, Surgeon to the Delagoa Bay Railway, Lourenço Marques, Delagoa Bay, South Africa,	1888
	Perigal, Dr A., New Barnet, Herts,	1887
	Peters, Dr James A., 97 Keptie Street, Arbroath,	1892
290	Pirie, Dr John, 10 Ardmillan Terrace,	1888
	Playfair, Dr John, 5 Melville Crescent,	1873
	Poole, Dr T. D., Aberdeen Cottage, Poulton-le-Fylde,	1890
	Porteous, Dr J. Lindsay, 83 Warburton Avenue, Yonkers, New York,	1875
	Price, Dr A. W. Gordon, 9 Grange Road,	1890
295	Price, Dr E. F. T., 1 Middleby Street,	1890
	Primrose, Dr Alex., 196 Simcoe Street, Toronto, Canada,	1887
	Pringle, Dr J. Hogarth, 1 Holland Place, Glasgow,	1886
	Proudfoot, Dr Thomas, 13 Lauriston Place,	1884
	Puckle, Dr S. Hale, Bishop's Castle, Shropshire,	1885
300	Ranking, Dr J. E., Tunbridge Wells,	1881
	Rattray, Dr A. M. T., Portobello,	1869
	Reid, Dr W. L., 7 Royal Crescent, Glasgow, W.,	1880
	Reid, Dr W. Spence, Oakley, Kirkcudbright,	1880
	Rendell, Dr Herbert R., P.O. Box 606, St John's, Newfoundland,	1882
305	Richardson, Dr William, 1 Belgrave Villas, Cothum Grove, Bristol,	1884
	Ritchie, Dr A. Brown, 117 Boston Street, Hulme, Manchester,	1892
	Ritchie, Dr D. W. L., 22 East Claremont Street,	1883
	Ritchie, Dr James, 22 Charlotte Square,	1880
	Ritchie, Dr R. Peel, 1 Melville Crescent,	1861
310	Roberton, Dr Ernest, Auckland, New Zealand,	1887
	Roberts, Dr Ernest T., 85 Skipton Road, Keighley,	1890
	Roberts, Dr R. W., Cunard Terrace, Cwmavon, near Port Talbot, South Wales,	1894
	Robertson, Dr J., 30 Lauriston Place,	1881
	Robertson, Dr John A., care of F. Stenhouse, Esq., Kelso, Kenilworth, Cape Town, South Africa,	1892
315	Robertson, Dr W. B., St Anne's, Thurlow Park Road, West Dulwich, London, S.E.,	1870
	Robertson, Dr W. G. A., 26 Minto Street,	1889
	Robins, Dr H., Sav-la-Mar, Jamaica,	1893
	Robinson, Dr H. Shapter, Talfourd House, 78 Peckham Road, Camberwell, London, S.E.,	1890
	Robson, Dr B. S., 66 Brighton Grove, Newcastle-on-Tyne,	1887

		Date of Admission.
320	Ronalds, Dr Tennent, Killochan Castle, Girvan,	1887
	Ronaldson, Dr T. R., 3 Bruntsfield Terrace,	1877
	Rosa, Dr Albert F., 20 Dundonald Street,	1893
	Rosa, Dr George, 12 Gayfield Square,	1867
	Russell, Dr W., 3 Walker Street,	1890
325	Salmon, Dr C. Carty, "Newells," Toorak Road, South Yarra, Melbourne, Australia,	1891
	Sang, Dr J. E., 136 Bedford Hill, Balham, London, S.W.,	1889
	Sapara, Dr Oguntola, Lagos, W. C. Africa,	1895
	Saunders, Dr F. A., Grahamstown, Cape Colony, South Africa,	1885
	Schofield, Dr L. J., Warrensburg, Mo., U.S.A.,	1893
330	Scott, Dr T. R., Musselburgh,	1880
	Shaw, Dr W. J., Cockburnspath,	1892
	Shiels, Dr G. F., 229 Geary Street, San Francisco,	1887
	Simpson, Dr W. Petrie, Tattershall, Lincoln,	1892
	Sloan, Dr Allen T., 22 Forth Street,	1893
335	Sloan, Dr S., 5 Somerset Pl., Sauchiehall St. West, Glasgow,	1887
	Smart, Dr David, 74 Hartington Road, Sefton Park, Liverpool,	1882
	Smith, Dr D., 16 Melville Lane, Montrose,	1870
	Smith, Dr G. H. Walton, Erang, Oxford St., Sydney, Australia,	1892
	Smith, Dr Gains T., Moncton, New Brunswick, Canada,	1891
340	Smith, Dr James, 1 Parsonsgreen Terrace,	1891
	Smith, Dr John, Brycehall, Kirkcaldy,	1885
	Smith, Dr J. Gordon, Accra, Gold Coast, West Africa,	1892
	Smith, Dr William, 14 Hartington Gardens,	1890
	Smith, Dr W. Ramsay, The General Hospital, Adelaide, South Australia,	1892
345	Sneddon, Dr William, Cupar-Fife,	1888
	Somerville, Dr Robert, Galashiels,	1881
	Spalding, Dr William, Gorebridge,	1867
	Spence, Dr R., Burntisland,	1878
	Spence, Dr William, Dollar,	1884
350	Stephen, Dr W. A., Loftus-in-Cleveland, Yorkshire,	1894
	Stephenson, Dr W. H., 137 Rochdale Road, Harpurhey, Manchester,	1895
	Stevens, Dr John, 3 Shandon Crescent,	1894
	Stewart, Dr J. S., 15 Merchiston Place,	1884
	Stewart, Dr R., 42 George Square,	1885
355	Stirling, Dr R., 4 Atholl Place, Perth,	1892
	Stirling, Dr Stewart, 4 Coates Crescent,	1866
	Sturrock, Dr J. F., Arima, Broughty-Ferry,	1887
	Sym, Dr A. C., 144 Morningside Road,	1885
	Taylor, Dr William, 12 Melville Street,	1868
360	Taylor, Dr W. Macrae, 12 Melville Street,	1895
	Teacher, Dr C., 16 Newington Road,	1887
	Temple, Dr G. H., 2 Sydenham Terrace, Weston-super-Mare,	1888
	Thatcher, Dr C. H., 8 Melville Crescent,	1877
	Thin, Dr Robert, 38 Albany Street,	1891
365	Thom, Dr Alexander, Viewfield, Crieff,	1884
	Thompson, Dr James L., Castlemaine, Victoria, Australia,	1894
	Thomson, Dr A. D. R. Musselburgh,	1877
	Thomson, Dr Alexis, 32 Rutland Square,	1887
	Thomson, Dr James, David Place, St Heliers, Jersey,	1881
370	Thomson, Dr John, 14 Coates Crescent,	1887
	Thomson, Dr J. Stitt, The Mount, Lincoln,	1877
	Thyne, Dr T. J., 2 Dean Terrace,	1887
	Tod, Dr John, 93 Ferry Road, Leith,	1892
	Tristan, Dr R. J., 10 Chapelgate, Retford, Notts,	1887
375	Underhill, Dr C. E., 8 Coates Crescent,	1872
	Underhill, Dr Frederick T., Mission City, British Columbia,	1885
	Underhill, Dr T. Edgar, Dunedin, Barnt Green, Worcestershire,	1879
	Vassie, Dr Alexander H., Wemyssfield, Kirkcaldy,	1891

		Date of Admission.
	Vickery, Dr W. H., 52 Elswick Road, Newcastle-on-Tyne,	1892
380	Wade, Dr George, Melrose,	1893
	Walker, Dr Andrew, Sandon House, Brunswick Street, Sheffield,	1893
	Walker, Dr A. Wallace, 24 Forth Street,	1886
	Wallace, Dr Abraham, 39 Harley Street, London, W.,	1879
	Watson, Dr P. H., 72 Jesmond Road, Newcastle-on-Tyne,	1887
385	Waugh, Dr John, 36 Finsbury Pavement, London, E.C.,	1881
	Webster, Dr A. D., Belleville Lodge, S. Blacket Place,	1881
	Webster, Dr J. C., Oxford House, Bethnal Green London, E.,	1889
	Welby, Dr Frederick E., Colonial Surgeon, St Helena,	1889
	Wilcockson, Dr G. Morton, 183 Southampton Street, Reading,	1893
390	Wilkinson, Dr George, 109 Park Road, Liverpool,	1889
	Will, Dr Ogilvie, 379 Union Street, Aberdeen,	1867
	Williams, Dr J. D., 20 Windsor Place, Cardiff,	1889
	Wilson, Dr James, 53 Inverleith Row,	1889
	Wilson, Dr T. D., 10 Newington Road,	1879
395	Wise, Dr Robert, 5 Weston Park, Crouch End, London, N.,	1890
	Wood, Dr Isaac. Kingston, Ontario,	1893
	Wood, Dr Russell, 9 Darnaway, Street,	1880
	Wood, Dr Thomas, 55 Ferry Road,	1886
	Wood, Dr William, 19 Roxburgh Street,	1892
400	Wright, Dr W. F., Bonnington Mount, Bonnington Terrace,	1887
	Wylie, Dr Hamilton, 1 George Place,	1879
	Yoe, Dr Richard T., 2103 Floyd Street, Louisville, Kentucky, U.S.A.,	1891
	Young, Dr J. Y. Simpson, 8 Alva Street,	1891
	Young, Dr Peter, 43 Heriot Row,	1859
	Young, Dr Peter A., 25 Manor Place,	1871
406	Young, Dr R. J. Erskine, 8 Alva Street,	1892

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TRANSACTIONS

OF THE

EDINBURGH OBSTETRICAL SOCIETY,

FOR SESSION LVII., 1895-96.

MEETING I.—NOVEMBER 13, 1895.

Dr A. H. FREELAND BARBOUR, *President, in the Chair.*

I. THE following gentlemen were elected Ordinary Fellows of the Society:—J. Hosack Fraser, M.D., Bridge of Allan; Stewart Grant Ogilvy, M.B. C.M., 12 Graham Street; T. Johnson-Alloway, M.D., 23 Mackay Street, Montreal; and Howard Morgan, M.B., 7 The Crescent, Birmingham.

II. VALEDICTORY ADDRESS.

By A. H. FREELAND BARBOUR, M.D., F.R.C.P. Ed.

IN a valedictory address we instinctively look round and back,—round on the company who are with us, to note who have fallen out on the march, and back over the ground traversed during the past two years.

From our Society's ranks we miss the striking face of Thomas Keith, a pioneer in Ovariotomy. It is difficult for us to realize to-day, when the operation is done with safety and by every one, what his work was who did it while success was doubtful, and in the face of a hostile prejudice, but who continued on his way in the confidence that he would yet place it on a basis above criticism. It would take the knowledge of one who had lived through that time, and an abler pen than mine, to write an encomium worthy of Thomas Keith; I content myself with calling him a pioneer, a man who dares to go where no one has gone before, to do what no one has done before. The indomitableness of the Arctic explorer rouses our enthusiasm not more than that of men like Clay, and Wells, and Keith, who, undaunted by the fogs of ignorance, or the chill wind of criticism, or an ice-bound

conservatism, broke through all and won the goal. But Keith had other gifts than that of indomitableness, which marks the pioneer. It was the blending of this quality with a womanly consideration for the wellbeing of his patients which made him a strong man. To appreciate this last characteristic, one has only to turn from the record of Keith's work in Operative Gynecology to that of those who do not give the ultimate wellbeing of the patient as prominent a place in operative methods as the mere success of the operation or even brilliancy of technique. The operations which Keith did *not* do are as great a testimony of his strength of character as the operations which he did.

Operative Gynecology has made an enormous stride since Clay, and Spencer Wells, and Keith made the removal of ovarian tumours a safe and simple operation. Then, attention was directed to conditions endangering life; now it is to those affecting wellbeing. Operations are being done every day for conditions which are only exceptionally fatal, but which either interfere directly with the pursuit of the patient's avocation, or make actual living a burden. This is a great step forwards, but with it the criterion of the operation necessarily shifts. The test as to the justifiability of operating is no longer merely the mortality of the operation, but its ultimate effect on the wellbeing of the patient. In the records of abdominal section we can no longer be satisfied with a long list of recoveries, by which is only meant recovery from the operation, but require such entries as "cured" or "permanently benefited,"—which, it is needless to say, can often only be made a few years after the operation has been done. Further, the grouping of all abdominal sections together belongs to the days when the fact that the peritoneal cavity was opened into was considered the peculiar and dangerous feature in the operation. Now there is no more reason for grouping together abdominal sections as such, than for putting together an amputation of the toe and amputation of the thigh because they are both operations on the leg. To do this will manifestly diminish the value of any statistics as to mortality. So far as it is possible, it would be well to divide abdominal sections into two groups:—1. For conditions affecting life; 2, for conditions affecting health,—the criterion for the first to be recovery from the operation; of the second, restoration to health. Until such a distinction is drawn it will be impossible to pronounce as to the validity of many of the operations now being done. In our hospitals we have now systematic registration of mortality; might it not be possible to have registration as to cure—that is, in all cases of operation for chronic invalidism (and this is called for not only in the case of abdominal section, but all forms of surgical interference), to have the patient reporting herself or himself, from time to time, until such a period has elapsed that a positive statement as to cure or the reverse could be made. This is done occasionally, when we

have cases shown some time after operations; but unfortunately it is only the successful cases that present themselves. A morbid delicacy makes those patients who are not so well keep in the background.

From the roll of our Corresponding Fellows we miss the name of William Leishman, whose well-known *System of Midwifery* has won for him an honoured place in Scottish midwifery. His students delighted to speak of him as an ideal teacher; and for intimate acquaintance with the literature of all the schools, English and foreign, and lucid exposition, his text-book at once took a high place. He was engaged in preparing the fifth edition of it at the time of his death. His most important contribution to midwifery was his book on the *Mechanism of Parturition.*

Of distinguished foreigners among our Honorary Fellows, mention must be made of William Goodell, who was for twenty years Professor of Gynecology in Philadelphia. His *Lessons in Gynecology* was a very popular work in America, and ran through three editions, the vigorous, crisp style and piquant expression making it an eminently readable book.

Among our Ordinary Fellows we shall miss the familiar face of Dr T. A. G. Balfour, one of a family well known both in the Church and Medicine, and who was for forty years a member of our Society; and especially Dr David Wilson, whose name has been on our roll for half a century, and whom our Society honoured by making him one of its Presidents. Though he has not contributed largely to our Transactions, the address which he delivered from this chair showed the grasp which he had of the subject of Obstetrics, an address which Dr Keiller characterized as "excelling in its exhaustiveness all previous communications which he had heard from this chair."

Passing now to the ground covered by our Society's work during the past two years, we note that of forty-five papers read, seventeen dealt with Obstetrical and nineteen with Gynecological subjects, eight with Pediatrics, while one covered all the three.

The Obstetrical papers took up such questions as the composition of the blood in pregnancy and of the liquor amnii, chorea gravidarum, the sacculated pregnant uterus, prolapse of the bladder, and brain lesions with symptoms simulating hysteria in pregnancy. In Normal Labour our attention was directed to sectional anatomy, the position of the fundus uteri determined clinically, and the third stage; while in its pathology such topics were taken up as contraction of the vagina, exomphalos of the fœtus, and the value of Champetier de Ribes's bag, and of Walcher's position.

The Gynecological papers dealt with the classification of the diseases of women, utero-sacral cellulitis, twisting of the pedicle in ovarian tumours, dilatation of the bladder with blood-clot simulating pregnancy, cases of vesico-rectal and vesico-vaginal

fistula, and the examination of the bladder by Kelly's method. Under Gynecological Therapeutics we might place such topics as electricity, the organic extracts, quinine, and the effect of removal of the ovaries on metabolism. Operative Gynecology was represented by papers on extra-uterine gestation, hysterectomy for fibroids in pregnancy, and ovariotomy in cases of twisted pedicle.

In Pediatrics there were papers on ante-natal pathology in the Hippocratic writings, the fœtus amorphus anideus and mylacephalus, the resuscitation of the asphyxiated child, rigor mortis in the new-born, the promontory mark, and operation for depressed cranial bones.

I purposely refrain from burdening this list with authors' names, but you will allow me to say how much we appreciate papers from our foreign Corresponding Fellows, such as Professor Curatulo of Rome and Dr Coromilas of Calamata.

Of this varied list of topics the freshest was that dealing with the composition of the maternal and fœtal blood, and papers on such physiological questions will always be heartily welcomed. As a model of a statistical paper on a clinical subject I might cite that on chorea. In the domain of Therapeutics the use of organic extracts opens up a new field of inquiry, and as a kindred topic we might place the effect on metabolism produced by the removal of the ovaries. The mode of action of the interpolar current in electrical treatment is a third subject which we have had before us, with regard to which we have had to confess our ignorance. Much of our treatment is necessarily empirical, although the mind is never satisfied until a reason can be given. Tarnier had established the value of corrosive sublimate in obstetric practice before its value as a germicide had been demonstrated, but without that demonstration it would not have received the world-wide acceptance it enjoys to-day.

In Operative Gynecology there has been nothing new recorded, although the papers on extra-uterine gestation showed that a good deal has yet to be done in laying down the best lines of treatment for this condition.

The value of our Transactions to the practical man would be enhanced if we had more papers like that on utero-sacral cellulitis, dealing with subjects which are of first importance on account of their very commonness. Amongst the various lectures in clinical medicine to which one listened as a student, a series which Sir Douglas Maclagan delivered on Phthisis are the only ones that stand out now. Others dealing with rare and curious affections were speedily forgotten, because a case of the same nature has never occurred again in one's experience to revive the impression made. I only give this as an illustration of what might with profit guide us in choosing topics for papers. The function of a Society like ours is not to teach in the sense in which students are taught; but it might do useful work in occasionally discussing

commonplace subjects from the point of view of the man engaged in practice.

As examples of unremitting industry the papers on fœtal teratology are beyond all praise.

Perhaps the most interesting contributions to our Transactions have been the two discussions at our summer meetings. They were on subjects of great practical moment, and were enriched by the experience of those members of our Society who are engaged in country practice. It is a shock to the graduate on going into practice to find that a great deal of what he has been taught in hospital as desirable is not possible in practice. His opportunities of going into his cases are circumscribed, and his treatment is limited by the want of hospital resources in a private house. A Society like ours holds the balance, for on the one hand you have hospital teachers laying down a counsel of perfection, and on the other the man engaged in country practice stating what he believes to be practicable,—the attainable ideal lying somewhere between the two.

The discussion on Antiseptics in Midwifery brought out this fact, that the use of a vaginal douche in the puerperium does not necessarily form a part of the antiseptic management of normal labour.

The mention of antiseptics in midwifery compels me, at the risk of being accused of wandering from my subject, to turn aside to pay a tribute to the memory of Pasteur. No two things seem at first sight to be more unrelated than the discovery of the lactic acid ferment and the diminished mortality of women in childbed. Nevertheless, the one is connected with the other. Link by link one can follow the chain from the discovery of the lactic acid ferment, through the discovery of the germs of septicæmia in puerperal fever by Coze and Feltz, and the consequent application of the germ theory to its causation, up to the placing of antiseptic midwifery on a solid scientific basis. The obstetrician, alike with the physician and surgeon, would place a wreath on the tomb of the beneficent Pasteur.

While the discussion on Antiseptics ended in a unanimous finding, the Registration of Midwives opened up a much-vexed question on which the last word will not be spoken for some time to come. As to the dangers to women in childbirth from incompetent midwives there is agreement; but whether the remedy lies in the registration of midwives is still *sub lite*. Fortunately, we in Scotland are not called on to make up our minds at this stage, but may have the opportunity of watching the experiment tried in England, which asks for home rule on this point. One practical result of the discussion in our Society was to elicit the fact that we do not feel the need of legislative interference at present, and we can therefore watch the experiment without any bias.

There are certain considerations worth bearing in mind when we consider this question. Registration of midwives is not analogous to registration of medical practitioners, except in so far as examinations have a reflex effect on the course of training. Registration in the medical profession derives its strength from the public opinion within the profession as regards who should be on the register. Further, the court that sits in judgment on doubtful cases is one of the learned corporations that embody that opinion. Registration is simply the outward expression of an existing opinion. Among midwives as a class there exists no such opinion, and the application of registration to them, or rather the working out of it, will be more of a police system imposed from without. Further, the body which is to sit in judgment on the removal of individuals from the register does not exist, and its constitution is involved in difficulty. There is also a danger of registration being a dead letter, because there is no one to move in cases of *malpraxis*. The medical profession will never take up the odium of informing against midwives, and it remains to be seen who are the parties who will move in cases of *malpraxis*, short of the cases that are so flagrant as to bring the midwife within range of criminal procedure, for which we have already the necessary legal machinery without any Registration Act.

As regards a system of examination as a test for admission to the register, the difficulties which exist with regard to this in the registration of medical practitioners should give us pause. The pressure that can be brought to bear on Examining Boards is largely moral,—its strength lies in medical opinion rather than in the Medical Act. And I believe that if a Midwives Act was passed, we should be at once in the face of similar difficulties, and in a more pronounced form.

A great argument for the registration of midwives was removed when women were admitted to the medical profession. Among other justifications of this step was the feeling which exists in some quarters that women should be attended by women. Now, however, that women have an equal position with men on the register, I think it savours of a retrograde step to reinstate the ancient order of midwives. Any movement to educate the midwife more thoroughly we should heartily welcome, as the present course of training is inadequate. The present legislative proposals, however, make no reference at all to this question; and even with such a more extended course, her position must always be subordinated, as it is subordinate, to that of the fully-trained practitioner, and her work done under his direction. Cases where this is impossible must be treated as exceptional.

In connexion with the summer meetings an attempt has been made to revive the social element in our Society's life; and at our dinner last July we celebrated the semi-jubilee of one who has thrice occupied our Presidential Chair, and who has done much to

further the interests of our Society—and in no way more than this, in his remarkable power of setting other men to work. One has but to glance over our Society's Transactions for the last fifteen years to see how much he has enriched them by his own pen, and still more how he has multiplied himself in the work of the five men who are always proud to talk of him as "their chief."

Our Society now enters on its fifty-sixth year; and while its record is good, it must be confessed that it is not proportionate to the amount of work that it should turn out, when we take into account its membership, its opportunities, and the encouragement given to research. Nor is the quality of the work done altogether what it should be. Any feeling of pride we may have on glancing over our Transactions is rebuked when we pick up the *Archiv für Gynäkologie* or the *Zeitschrift für Geburtshülfe*. We have not been able as yet to compete with the Germans in laboratory work, because our graduates have not the means, the material, nor the time. The difficulty as to means has been got over by the establishing of the Laboratory of the Royal College of Physicians; and our Society gradually acknowledges the enterprise of the College of Physicians in founding this institution, and wishes it all success in its efforts to provide still better accommodation for its workers. The scanty material for laboratory work will always handicap us in a small centre like Edinburgh. Nothing strikes one more in visiting one of the large German centres like Berlin, than the enormous wealth of material in their large hospitals and pathological departments. The lack of time is also a difficulty, as most are compelled on graduation to plunge at once into practice. Yet even here in some cases there is a reach of back-water in waiting for practice, which is an invaluable opportunity for original work. And even in the rush of practice there should always be time to observe and systematize the results of observation. Our best papers have been written by busy men.

There are three kinds of work that might be done, all equally valuable,—literary, laboratory, and clinical. Those whose interests lie in reading can render a great service by collecting all that has been written worth reading, systematizing and digesting it. So much literature is now pouring in on all sides that a new department of work has arisen in connexion with it. The literature heap grows so rapidly, and contains so much rubbish concealing the gems, that original research with regard to it is becoming a necessity. We owe an infinite debt to the man who can say, I have gone through it all, and this is the net result. Here, of course, thoroughness is a necessity. To use abstracts, or mere references to papers, or even to be content with reading the summary which the writer gives at the end of his paper, takes away from the peculiar value of

this kind of work. The stamp of original research here is that it deals with the original. Distinct from this, though connected with it, is critical work, calling into use a different faculty, which all are not gifted with. But where it is present the best work may be done during the period I have spoken of. A new eye sees fresh lights, and the student mind after it has passed through its course of training and finds itself free to criticize facts and theories, may do work at this time for which it loses the opportunity, if not also the capacity, after it has been in contact with practical life.

Laboratory work can only be done by a few, and the possibility for it depends on the position in which a man finds himself after graduation. Its results have formed a distinct feature in our Transactions in recent years, and will, we hope, more and more continue to do so.

The great desideratum in our Transactions is, however, good clinical papers. The absence of these not only makes our Transactions less digestible, but lowers the nutritional value in the eyes of the practical man. "Too many raisins and too little suet for my taste," he says,—the remedy for which, of course, is not to lessen the former, but to increase the latter.

There is an enormous wealth of clinical experience being acquired by the Fellows of our Society engaged in practice up and down the country, which is lost. It is in solution, but requires precipitation to make it visible and permanent; and our Society should be the thread round which crystallization takes place. What deters most men from contributing is the thought that their molecule is not worthy of consideration, while it really forms an essential part of the solution.

Along whichever line we prefer to work let us produce something. The mountain chain of coral which rises from the still depths of the Pacific, skirting the coast of Australia for over a thousand miles as the great barrier reef, is the work of a living fringe of coral polyps, each of which during its lifetime secretes a few grains of lime from the sea, and adds it to the pile. We build to-day on the work of generations of unknown workers who have passed away. Before us lies truth, wide and deep as the sea. It is ours to gather a few grains and add them as our contribution to the barrier reef of science.

In retiring from this Chair, I have to thank you for the great honour you conferred on me in asking me to occupy it. Edinburgh has always held an honoured place in Midwifery and Diseases of Women, and round our Society have grown up the traditions which have made that name famous. Conscious of the responsibilities attached to this Chair, and of great deficiencies in their discharge, I gladly withdraw from it; and all the more so, because I have to welcome Dr Ballantyne of Dalkeith, who joined our Society five

and twenty years ago in company with one of our former Presidents, Dr Halliday Croom, and our indefatigable treasurer, Dr Craig, whose satisfactory balance-sheet continues to be one of the features of our Society's progress. From his long connexion with our Society, and his extensive clinical experience, there can be but one opinion as to our new President, and in your name I heartily welcome him to the Presidential Chair.

III. *Dr Ballantyne*, Dalkeith, in accepting office as President, thanked the Society for the honour, and at the same time proposed a vote of thanks to Dr Barbour for his address. This was seconded by *Prof. Simpson*, and carried unanimously.

IV. *Dr R. C. Buist*, Dundee, read the following NOTES ON A CASE OF ATRESIA VAGINÆ:—

The specimen was removed from the body of a single woman, aged 43. Of good family history (father, 72; mother, 55, after long illness, beginning in "typhoid"). There is no history of injury. In her sixteenth year she was thrice operated on for retained menses and swelling. In her thirtieth year she had pain in the left hypochondrium, and persistent looseness of the bowels, and she was never afterwards able to work. In her thirty-ninth year the looseness recurred, and never absolutely disappeared, though worse at times.

When I began to attend her in November 1894 she complained of weakness, giddiness, and pain in the left chest, radiating sometimes to the mamma and sometimes up the side of the head. She showed physical signs of anæmia, including cardiac murmurs, but no *bruit de diable*. The urine was normal, and she was said to menstruate regularly. She took very little food, and scarcely gained at all under tonic and stimulant treatment.

Jan. 5, 1895.—She to-day took a flooding so severe that she had simply to be wrapped up in a sheet and left. This had continued for three days, when I was sent for. Per rectum, I found the uterus not easily defined at the lower part, not tender, and not apparently enlarged. Menstruation was said to have been previously regular. Under ergotin, gr. 3, thrice daily at first, then every four hours, the bleeding was reduced but not removed, and, as she was getting very weak, on January 15 I attempted to make a vaginal examination, but could not effect an entrance.

Jan. 17.—Under chloroform, I found a line of apparently cicatricial tissue, about 2–3 cms. long, passing forwards from the posterior part of the vulva and ending at the posterior part of a small oval opening less than 1 cm. long. In the posterior half of this line was a dimple, into which I could not pass a probe. No separate urethral orifice was visible. The labia were normal. Thinking I had here the vaginal opening, I passed a director and slit the posterior wall of the opening back till I could pass my

finger. On doing so I found that, after passing through a canal about 2 cms. long, the finger was in ovoid cavity with rugose walls. Nothing resembling a urethral eminence was felt anteriorly. With a second finger in the rectum, a wedge-shaped mass, apparently in the septum, was felt at the upper part, but no trace of a separate cervix uteri could be felt. Evidently, then, the cavity which I was exploring was the bladder, and the passage the urethra. As the patient threatened to collapse, further investigation was at that time impossible. After this she was in an almost typhic state for two or three days. She had incontinence of urine, and was fed with difficulty. Under forced feeding she recovered strength, and by January 30 she had again control of the urine, and the red discharge was becoming less. She continued to gain strength, and in March was able to get up; but on March 23 she fainted, and next day diarrhœa and tenesmus set in, and the diarrhœa proved very difficult to manage. She had no more hæmorrhage, but gradually lost strength again, though not so anæmic. In June she had severe headache and pain in left arm and shoulder. She had dimness of vision. Without definite sign of physical disease, she gradually sank again into a cataleptic and then typhic state, and died in August.

In the family history it is now of interest to note that her elder twin sister has borne a child, apparently normally.

An autopsy was made four days after death. Except slight enlargement of the kidneys and spleen, and old adhesions of the left lung to the pleura, no abnormality was found in head, thorax, or abdomen. The lower genito-urinary apparatus was removed for more detailed examination.

Between the dilated urethral orifice and the anus is a funnel-shaped area (spirit preparation has exaggerated this) ending in a dimple, through which a probe could be passed. This probe issued in the rectum, where we find on the anterior surface a groove 2 cms. long, ending in a dimple similar to that external, and forming the inner end of the canal through which the probe passes. On slitting up this canal we find on its anterior surface an indication of another passage passing in the direction of the vagina; this is, however, impervious. On opening the anterior wall of the bladder and urethra, we find the urethra 2½ cms. long, and on its under surface, 1 cm. inwards, we find a small deep pit almost at right angles to the line of the urethra, and crossed by two thin, flat strands of mucous membrane. The uterus is of normal consistency, somewhat unsymmetrical, as the body is considerably thicker on the right side than the left. Opening the posterior surface, we find that its cavity measures 7½ cms., and terminates in a small vagina with smooth walls. The cervix is slightly indicated anteriorly and laterally, but posteriorly there is seemingly no distinction between the uterine and vaginal surface. The vagina is 3 cms. long, and just below the cervix 3 cms. wide; it contracts to 1½ cms.,

and terminates in three small puckers. Through the central one a probe passes, and is found to issue in the urethra at the point described, below the strands of mucous membrane. The obstructed part of the vagina measures about 2 cms. The tubes and ovaries seem normal, but on the under surface of the left ovary is a small fish-bone attached by two fibrous bands. There are several strands of adhesion in the pouch of Douglas.

We have in this case probably a congenital obstruction of the vagina giving rise to hæmatocolpos, which, after cutting into the rectum, the surgeon relieved by making a vagino-urethral fistula through which the woman menstruated regularly, the position of the fistula halfway out the urethra allowing the discharge to go on apart from that of the urine. There are several cases similar to mine in Neugebauer's monograph, *Verwachsungen und Verengerungen der Scheide*, Case 547, Dieffenbach, resembling it closely in its surgical accidents, but the clinical interest seemed sufficient to make the specimen worth showing.

Prof. Simpson thought the Society was much indebted to Dr Buist for his interesting record of a rare gynecological case. It was seldom that the opportunity was obtained of dealing with cases of atresia vaginæ, and still more seldom that the history of the patient in later years was given. It was often extremely difficult to determine whether the menstrual accumulation due to closure of the vagina should be let out by tunnelling between the rectum and bladder, or be got at by a laparotomy. Sometimes it was necessary to open the cavities from both directions, because there might be accumulations in different parts of the genital canal, in the vaginal roof, in the uterus, or in the tubes, and the fluid might not be evacuated by an opening made from one direction alone. The presence of the bone below the right ovary made the case of itself quite unique.

Dr J. W. Ballantyne referred to an interesting case of congenital vaginal atresia reported by H. Hahn (*St Louis Med. and Surg. Journ.*, Nov. 1895) in which a vicarious menstruation took place from the bladder until an artificial vagina was formed, when the vesical hæmorrhage gradually ceased. The presence of the foreign body in the pelvis in Dr Brewis's specimen was interesting, and brought to his mind a case in which a needle (probably aspiratory) had been found in the pouch of Douglas; the specimen had been shown to the Society some years back by Dr J. D. Williams.

V. TERATOGENESIS: AN INQUIRY INTO THE CAUSES OF MONSTROSITIES.

By J. W. Ballantyne, M.D., F.R.C.P.E., F.R.S.E.

Introduction.

From the earliest times attempts have been made to explain the occurrence of teratological phenomena. Many have been the theories advanced, and great has been the difference of opinion they have evoked; but it may be truly said that till within the last half-century little real progress had been made in this field of study. During the last few years, however, an immense amount of light has been thrown upon this obscure subject, and science now possesses a vastly wider and more accurate knowledge of the causes which lead to the production of monstrosities and of the manner in which they act. Since much of the work that has been instrumental in bringing about this improved condition of matters has been little, if at all, referred to in current medical literature; since, also, the practical bearings of several of the discoveries that have been made are very evident and of great importance, it has seemed to me desirable and opportune to pass in review the teratogenic theories that have been from time to time advanced, and to indicate the lines along which recent research has been working and the results which have been thus obtained.

Some of the views held by the ancients regarding the cause of monstrous births have long since been abandoned, and are now to be met with only amongst savage races; others are still accepted by the popular mind, but rejected by the scientific; and yet others have found a certain degree of justification in the results of the clinical and pathological investigations of the present age. But in addition to the ideas handed down to us as a heritage from past times there are those which have been brought into being or confirmed in existence by that powerful agent of modern scientific research, experiment. The artificial production of monstrosities or experimental teratogeny has done more than any other method of investigation to explain in a rational way the causes of teratological formations and the manner in which they act, whilst it has also clearly demonstrated that teratology is not an isolated subject of little interest save to the curious, but an integral and important part of pathology, with practical bearings upon many of the problems of medicine and surgery.

In the following pages the attempt will be made to trace the history of the various teratogenic theories which have been handed down to us from early ages, or have sprung up within more recent times. The light which experimental teratogeny has thrown upon these theories will be also referred to, and thereafter the way in which teratogenic causes act will be discussed. I hope thus to be

able to show how order has in a large degree been evolved from chaos, and an apparently unprofitable subject converted into a certainly fertile field of research.

It may be well here to indicate the scope of the inquiry and the order in which the various points will be considered. This is done in the following table:—

I.—CAUSES OF MONSTROSITIES.

A. Theories of the Past.
  1. Supernatural Causes.
  2. Physical Causes.
  3. Mental Influence.

B. Theories of the Present.
  1. Mechanical Causes.
  2. Diseases of—(*a.*) Fœtus; (*b.*) Fœtal Annexa.
  3. Embryological and Germinal States.
    (*a.*) Heredity and Atavism.
    (*b.*) Environment.
    (*c.*) Germ Infection.

II.—MODE OF ACTION OF THE CAUSES.

1. The light which experimental teratogeny throws upon the mode of action of the causes of monstrosities.
2. Teratogenic processes.

I.—CAUSES OF MONSTROSITIES.

A. THEORIES OF THE PAST.

1. *The Supernatural.*

In the early ages of the world's history it was customary to ascribe all unusual phenomena of Nature—earthquakes, comets, eclipses, and the like—to supernatural causes. Abundant evidence of this is to be found in the literature and legends of the past, and in the customs and beliefs of savage or primitive peoples existing at the present time. Amongst the unusual phenomena of Nature malformations and monstrosities of the human fœtus or of the young of the lower animals could scarcely fail to find a place, and so it happens that in the earliest records of teratology are to be found hints, and even proofs, that such occurrences were regarded as due to supernatural agencies. In different parts of the world, and in the same part but at different times, opinions differed as to the nature of the supernatural teratogenic cause and the meaning of the teratological phenomenon. Some peoples ascribed monstrous births to the gods they worshipped; other races, who had divided their pantheon into good and evil deities, put the blame sometimes upon the former and sometimes upon the latter; whilst yet others connected teratological states with the position and

mode of combination of the stars and other heavenly bodies. Polytheism was succeeded, in certain countries, by monotheism, yet the same ideas lived on, naturally altered in some degree to suit the newer conceptions of the supernatural. To the God of the Jew and the Christian, to the Satan of the Old Testament and the evil spirits of the New, and to the stars in the midnight sky, men still looked as the causes, directly or indirectly, of the deformities with which an infant might come into the world.

The meaning, also, of the teratological phenomenon was variously conceived. The gods were amusing themselves, said some; they were exhibiting the extent of their creative powers, said others; they were angry with men, they were warning mankind, or they were chastising individuals or countries, were the views of yet others. From such beliefs the idea soon gained ground that monstrosities were portents of events in the future, that they foretold good sometimes, but more commonly evil fortune. The Chaldeans read in the starry heavens the secrets of the future, and rapidly learned to transfer to the monstrous infant born under this or that astral combination the meaning of the stellar message; and so in ancient Babylonia the birth of a babe of doubtful sex meant an approaching calamity to the land, whilst the appearance of one with an imperforate anus proclaimed a famine. Similar astrological beliefs were in vogue in Europe in the Middle Ages; but they did not reign alone, for a transference of teratogenic powers had taken place from the deity to the devil, and to the malign influence of the tempter and his emissaries—the mediæval succubi and incubi — were ascribed monstrous and malformed births. Happy was the mother of a deformed infant when she was able to show a preponderating amount of evidence in favour of the stellar origin of her abnormal progeny; otherwise a death at the stake awaited her and her "devil's brat."

Such were the various aspects in which the supernatural was invoked to explain the origin of malformed fœtuses, and it is necessary now to give some illustrations of the different phases of this ancient belief. These illustrative instances may be considered in three groups,—*first*, those which exemplify a belief in the deity as a teratogenic cause; *second*, those which ascribe this power to the evil one; and *third*, those in which astrology is regarded as the potent factor.

(1.) Abundant instances are forthcoming to show a widespread belief in the Divine power as the cause of monstrosities, and the following examples are cited to illustrate the various explanations given of the meaning of the exercise of this power.

It is possible that in the earliest ages of the world's history monstrous infants were regarded as divine, and worshipped. They might be the gods themselves or their progeny, or they might simply be simulacra of the deity. On this hypothesis it is easy to account for the teratological appearance of nearly all the heathen

gods and goddesses. Of course, many of them are unlike the cases of monstrosity met with at the present time, but then it must be remembered that facts handed down by oral tradition from distant times, and through the agency of men unacquainted with anatomical details, must inevitably become distorted. Doubtless the artificer of the idol was seldom, if ever, an eye-witness of the appearances of the deformed infant, and was consequently compelled to draw upon his imagination in order to eke out the scanty data handed down to him to work with. At the same time, in the two-headed, many-breasted gods of the East, in the achondroplasiac god Pthah of the Egyptians, in the cyclops of the Greeks, and in the fauns and satyrs of the Romans, are to be recognised monstrosities and malformations which are well known at the present day. Indeed, the one-eyed fœtus has been named cyclopic from its resemblance to the cyclopes of ancient times; and it is far from improbable that Polyphemus in his turn took his origin in the one-eyed fœtus of still earlier times. It is, therefore, a startling but not an unlikely conclusion to come to, that teratological specimens served to supply the races of mankind with many of the deities which they ignorantly worshipped.

To take up another line of thought, the gods were the creators of monstrous infants, and their purpose was amusement. *Ζεὺς παίζει*, Jupiter is playing, said Heraclitus; and Pliny (*Nat. Hist.*, lib. vii. c. 2) only slightly altered the idea when he wrote that Nature creates monsters for the purpose of astonishing us and amusing herself (Ludibria sibi, miracula nobis ingeniosa fecit natura).[1] Traces of this old belief are to be found at the present day in our use of the word "*Sport*" in Botany, and in the German "*Spielart*" and "*Naturspiel*," the French "*jeu de la nature*," and the Latin "*lusus naturæ*" as synonyms of monstrosity. A somewhat similar idea is conveyed by the expression "*freak of nature*."

Soon, however, the notion of the sportive, pleasure-seeking deities turning out monstrosities very much like children making mud-pies gave place to another and a graver conception. The gods were still the cause, but now their purpose was to warn, admonish, or threaten mankind. The belief in the monitory or minatory meaning of teratological occurrences took a firm hold on the minds of men, and the introduction of Christianity only meant the transference to the one God of the power and purpose that had been previously ascribed to the many deities of the Greek and Roman pantheon. It may be that the word monster itself is derived from moneo, I warn; but another origin has been suggested for it, to which reference will again be made. The birth of a deformed

[1] Holland (P.) in his *Translation* of Pliny (vol. i. p. 157, London, 1601) thus renders the passage, "See how Nature is disposed for the nones to devise full wittily in this and such like pastimes to play with mankind, thereby not onely to make her selfe merrie, but to set us a wondering at such strange miracles."

fœtus, then, was a Divine warning; it meant, further, that a deity must be propitiated, else some calamity would happen. From this belief to the sacrifice of the malformed infant is but a step, and thus doubtless arose one at least of the reasons why such monstrosities were, in Europe at any rate, almost invariably killed in the Early and Middle Ages. The Greeks of Sparta may have thrown their deformed infants into the abyss near Mount Taygetus in order to preserve the physical perfection of the race; but in other countries the killing was sacrificial and propitiatory, and fortunate was the mother if she escaped her infant's fate. Julius Obsequens,[1] for instance, states that, in the year 120 B.C., "in foro Vessano androgynus natus in mare delatus est;" and again, in 92 B.C., "Androgynus Urbino natus, in mare deportatus." Lucan,[2] also, in his *Pharsalia* relates how Arnus, the chief of the Etruscan diviners, ordered the slaughter and burning of all monstrous infants at the time of the overthrow of the Roman Republic.

Gradually it would appear that the idea of the deity as the cause of the monstrosity became lost in the consideration of the calamity which the malformed fœtus was supposed to predict, portend, or presage. The supposed cause of the phenomenon was lost sight of in the supposed effect. In this way it is believed that the word *monstrum* originated, viz., from *monstro*, I declare or show; and as Cicero[3] puts it, "Monstra, Ostenta, Portenta, Prodigia appellantur, quoniam monstrant, ostendunt, portendunt, prædicant."

Innumerable instances might be given of the pretended connexion between monstrous births and national or personal calamities and misfortunes; the works of Lycosthenes and Obsequens are full of them, and long lists of them were found in cuneiform characters on the brick tablets of the Royal Library at Nineveh.[4] Sometimes, but rarely, the event predicted was of a fortunate nature, as when Cæsar's horse with feet showing digits was regarded as an indication that the world would one day belong to the emperor (*Suetonius*). Notwithstanding active opposition on the part of such writers as Licetus and Polydore Vergil, the idea that monstrous births predict disaster held its ground in Europe till the close of the seventeenth century.

There is a small amount of evidence to show that a malformed infant was sometimes regarded as a punishment of sins committed. In early French history we read that Robert II. (the Pious), who succeeded Hugues Capet, married near the close of the tenth century his cousin (in the fourth degree) Bertha, daughter of Conrad, King of Arles, and widow of Eudes I., Count of Blois. For this reason the royal pair were excommunicated by the Pope

[1] *Julii Obsequentis Prodigiorum Liber*, pp. 86 and 103, Basileæ, 1552.
[2] Lucan, *Pharsalia*, lib. i. verse 589.
[3] Cicero, *De Divinatione*, lib. i. par. 42.
[4] Ballantyne, J. W., "Teratological Records of Chaldea," *Teratologia*, i. p. 127.

of Rome. The Queen gave birth to an infant having the head and neck of a goose ("une tête et un col d'oie"). Sismondi suggests that the monstrous infant was caused by the fright received by the Queen during her pregnancy from the Papal excommunication; but Ségur,[1] in his *Histoire de France*, states that the birth of the monstrosity was a punishment from God ("un punition de Dieu"). Ségur, however, describes the deformity of the child as a condition resembling the feet and not the head of a goose; possibly, therefore, it was a case of webbing of the digits. This display of the vicarious teratogenetic powers of the Pope seems to have brought Robert the Pious to his knees; at any rate, Bertha was repudiated in 1006, and the King married the haughty Constance, daughter of the Count of Toulouse. Possibly the disciples of our Lord had some thought of the punitive nature of congenital malformations when they put the question concerning the man born blind,—"Master, who did sin, this man, or his parents, that he was born blind?" Christ's reply, whilst in no way supporting the punitive theory of origin of the congenital blindness, probably gave rise to the notion that monstrous births were for the purpose of revealing the glory of God. Paré,[2] in his treatise on monsters, enumerates thirteen causes of such productions, of which the first is to proclaim the glory of God.

Curiously enough, the belief in the Divine origin of terata appeared again near the close of the seventeenth century as one of the consequences of the doctrine of the pre-existence of germs advanced by Swammerdam and Malpighi.[3] If normal germs pre-exist, why not also monstrous germs? This, however, Swammerdam and Malebranche would not admit, for they recognised that to do so would be to confess that monstrous infants were the immediate work of the Creator. Régis, in his *Système de philosophie* (III., lib. viii. pt. 1, c. ix.), accepted this consequence, and explained that, whilst normal beings showed forth the infinite wisdom of the Creator, monstrosities demonstrated His infinite power. The question thus raised of the original character of malformations gave rise to heated discussions in the French Académie des Sciences, carried on by Lémery, Duverney, and Winslow, between the years 1706 and 1743; and Haller,[4] in his treatise, *De Monstris*, published as late as 1768, seems largely to have regarded monstrosities as the result of germs originally monstrous. The study of embryology, however, soon put an end to such imaginings.

[1] Quoted by E. Martin, *Histoire des Monstres*, p. 78, 1880.

[2] Paré (A.), *Works*, translated by T. Johnson, lib. xxv. c. 1, p. 585, London, 1678,—"There are reckoned up many causes of Monsters, the first whereof is the glory of God, that His immense power may be manifest to those which are ignorant of it, by the sending of those things which happen contrary to Nature."

[3] *Vide* Dareste (C.), *Production des Monstruosités*, 2nd edit., p. 13, 1891.

[4] Haller (A.), *Opera minora*, III. p. 133, 1768.

(2.) It was inevitable that a belief in the teratogenic power of the deity should be followed sooner or later by the idea that this power was specially the possession of an *evil* or *malignant* spirit. According to certain of the older commentators, the events described in the first four verses of Genesis vi. refer to the cohabitation of apostate angels with the daughters of men, the consequence of which was the birth of giants ("monsters, prodigies," *Tuch, Knobel*); but this interpretation of the passage is not the one now generally accepted.

In northern Europe in early times the treatment of monstrous infants suggested a certain degree of belief in their diabolical origin. Du Chaillu, in his interesting work on the Vikings (*The Viking Age*, ii. p. 40), gives the following extract from an ancient legal enactment of the Norsemen:—"Every child which is born into this world shall be reared, baptized, and carried to the church; except that only which is born so deformed that the mother cannot give strength to it. . . . It shall be carried to a beach and buried where neither men nor cattle go; that is, the beach of the evil one."

From the early part of the Christian era up to the end of the seventeenth century the nations of Western Europe had opinions upon teratological subjects which reflected the beliefs and teaching of the early Fathers. To these men possession by devils was a real thing, and carnal connexion with demons was but an amplification of this belief. Deformed fœtuses were looked upon as the progeny of Satan, and to destroy them was to diminish his family. St Jerome and Thomas Aquinas were firm supporters of these doctrines. St Augustine and St Gregory seem to have had more enlightened views, but did not state them very strongly. At a time when "incubi" and "succubi" were given full credence to, it would have been strange indeed if the diabolic origin of monsters had not also been accepted. In the sorcery and witchcraft trials of the Middle Ages in France, Germany, and Britain are many signs of such beliefs. "Coitus cum diabolo" was a matter always inquired into, and in many cases torture wrung from the unfortunate accused confessions of the most revolting and terrible nature, as any one who chooses may read in Pitcairn's *Criminal Trials*. The Papal Bull of Innocent VIII. (A.D. 1484), which gave the full sanction of the Church to the persecution of sorcerers and witches, embodied the belief in Satanic dealings. It would be of no profit to go more fully into the history of this darkest fancy of these truly Dark Ages; but it may be mentioned that even Luther, writing in the next century after Pope Innocent's Bull, stated his belief in the possibility of little devils resulting from "coitus cum diabolo." A short reference may also be made, in passing, to the case reported by Hauppius (*Biblioth. port. pract.*, p. 454), and cited by E. Martin in his *Histoire des Monstres* (p. 50, Paris, 1880). It was that of a woman living in a town ruled over by Ladislaus of

Berstem, who gave birth to a headless (anencephalic) fœtus with deformed limbs. The infant was buried without baptism; but when the mother came to hear of it she asked that it should be burned, giving as her reason the fact that she had received a visit from a hopgoblin incubus ("un lutin incube"). Ladislaus, hearing of the circumstances, ordered the exhumation of the fœtus; it was carried outside the town to be burned; but the flames would not attack it, says the old record, and it was only after it had been chopped up into small pieces by the hangman that it could be destroyed. A somewhat similar incident is related by Hector Boethius as happening in the county of Aberdeen in Scotland.

Paré, in his treatise *Des Monstres* (1783), admitted the active intervention of demons as a teratological factor, and as recently as 1893 a notice appeared in an Australian newspaper concerning the birth of a hirsute and otherwise deformed infant, supposed to be the result of incautious remarks about the evil one made by the mother in her pregnancy.[1] Mediæval beliefs have had a very firm hold on the popular mind, and the curious one in question has formed no exception to the rule. To enter into the subject of the supposed *modus operandi* of the Satanic or diabolic influence would be unprofitable.

(3.) The position, movements, and combinations of the heavenly bodies have entered largely into the formation of the opinions and beliefs of ancient races concerning the origin of terrestrial phenomena. The Chaldeans were, as is well known, past masters in the art of divination from all kinds of phenomena, stellar or terrestrial. That they connected together teratological and astrological occurrences is also beyond doubt. Lenormant,[2] in his work on Chaldean divination, explains in a very reasonable way how this belief grew. The passage may be rendered as follows:—"The development that their astrology had given to 'généthliaque,' or the art of horoscopes of births, had led them early to attribute great importance to all the teratological facts which were there produced. They claimed that an experience of 470,000 years of observations, all concordant, fully justified their system, and that in nothing was the influence of the stars marked in a more indubitable manner than in the fatal law which determined the destiny of each individual, according to the state of the sky at the moment when he came into the world. Cicero, by the very terms which he uses to refute the Chaldeans, shows that the result of these ideas was to consider all infirmities and monstrosities that new-born infants exhibited as the inevitable and irremediable consequence of the action of these astral positions. This being granted, the observa-

[1] *Vide Teratologia*, i. p. 59, 1894.

[2] Lenormant (F.), *La Divination et la science des présages chez les Chaldéens*, p. 103, Paris, 1875.

tion of similar monstrosities gave, as it were, a reflection of the state of the sky, on which depended all terrestrial things; consequently one might read in them the future with as much certainty as in the stars themselves."

Astrology and the casting of horoscopes survived by many centuries the fall of the Babylonian empire; indeed, the notion of stellar influence upon the fœtus lives still in the expression "born under a lucky star," and Zadkiel's Almanac is a solid fact. Ptolemæus Claudius,[1] an Alexandrian astrologer of the second century, not only stated the astral conditions under which terata were born, but also mentioned the nature of the malformation to be expected. The position of Venus or of the moon at the moment of conception had, according to the astrological doctrine, a potent effect in determining whether the infant was to be normal or deformed. It was also alleged that monstrous creations were more common in tropical lands on account of the position of Venus in respect to the zodiac.

It may be well here to refer to a tale which illustrates the opinions in vogue in the early part of the thirteenth century with regard to animal teratology and astral conditions. About the year 1200 a cow gave birth to a calf said to be half human (possibly an example of fœtal hydrocephalis in the calf). The shepherd was in consequence accused of an unnatural crime, and was condemned to be burned alive. Albertus Magnus,[2] however, saved the man's life by giving it as his opinion that the teratological phenomenon was due to a certain constellation.[3] In this writer's work, *De animalibus*, it is stated that a monstrosity may be due either to a fault in the material or to celestial influence; when certain heavenly bodies are found in certain places in the sky a man cannot be generated, and so a child is born with the head of a bull or a lamb. It is evident, therefore, that Albert applied the same ideas to human as to comparative teratology. Thomas Aquinas, a disciple of Albertus, accepted these theories, and even expounded them to some extent. Cardanus,[4] a prolific writer of the sixteenth century (*b.* 1501, *d.* 1576) notable for the extraordinary mixture of sagacity and foolishness in his works, moulded his beliefs upon those of Ptolemæus Claudius already referred to; he even supplied his readers with the representation of the con-

[1] *Tetrabiblon*, lib. iii. c. viii. (*De monstris*). *Vide* Taruffi, *Storia della Teratologia*, iv. p. 18, 1886.

[2] Albert the Great was a most voluminous writer upon a vast number of different subjects, including theology, medicine, astronomy, metaphysics, etc. He was born in 1193 or 1205.

[3] Albertus Magnus, *De somno et vigilia*. Opera omnia, v. p. 64, Lugduni, 1651. Albertus Magnus, *De animalibus*, lib. xviii. cap. vi. tract 1, Venetiis, 1495.

[4] Cardanus (J.), Commentarium in Ptolemæum de astrorum indiciis, lib. iii., cap. viii., *Opera omnia*, v., Lyon, 1663.

stellation under which a double monster was born. Septalius[1] looked to the stars for the explanation of moles and nævi seen on the fœtus; and even T. Bartholin[2] believed in the potency of stellar influences on the unborn infant.

In a work entitled *Grande Encyclopédie universelle*, by Henricus Asteldius, and published about the beginning of the seventeenth century, it is stated that a Danish astronomer, who was also a medical man, had discovered the origin of monstrosities. He ascribed them to comets, and regarded them as tumours scattered throughout the firmament, which when they were precipitated upon the earth, took on there all kinds of unusual and extraordinary forms (E. Martin).

In the work by Aldrovandus (*De monstrorum historia*, p. 391, Bononiæ, 1642), edited by Ambrosinus, credence is given to the foregoing beliefs; at any rate, the views are stated and their adherents named. Ambrose Paré,[3] however, is openly sceptical, and says: "Yet astrologers (lest there should seem to be any thing which they are ignorant of) refer the causes of these (*i.e.* monsters) to certain constellations and aspects of the planets and stars." Licetus[4] altogether omitted the stars from his list of teratological causes, and so the theory died out, at any rate among scientists. A trace of the old belief in what may be called the teratogenic power of the heavenly bodies is preserved in the word "moon-calf," which Webster (*Dictionary of the English Language*) defines as (1) a monster, false conception; (2) a mole, or mass of fleshy matter generated in the uterus; (3) a dolt, a stupid fellow. Ogilvie (*Imperial Dictionary*, iii., N. Ed., 1882) gives to the word the same three meanings, and adds that it is comparable to the German "mond-kalb," a person or conception influenced by the moon. In a discussion in *Notes and Queries* (Eighth Series, iv. pp. 288, 432, and 475, 1893) upon the meaning of moon-blasting in connexion with the "churching of women" in the Episcopal service, it is stated by E. S. A. that "moon-blasting," as applied to women with child, had to do with the belief that the beams of the moon might cause an abortion known as a moon-calf. Most writers trace this belief back to Pliny; but this author uses only the word "mole." It is to one of his translators (Holland) that we owe the introduction of the term "moon-calfe" into the *Natural History*. Caliban, in Shakespeare's *Tempest*, is frequently referred to as a "moon-calf" or "monster." The names water-calves and moon-calves[5] (Wasser-kälber and Mondskälber) have been given to

[1] Septalius (L.), *Libr. de nævis*. Mediolani, 1606.

[2] Bartholin (T.), *De cometâ consilium medicum, monstrorum nuper in Dania natorum historia*. Copenhagen, 1665.

[3] Paré (A.), the Works of that famous Chirurgeon, Ambrose Parey. Trans. by Th. Johnson, p. 601, London, 1678.

[4] Licetus (F.), *De Monstris*, lib. i., cap. 6, Patavii, 1668.

[5] Ballantyne (J. W.), *Diseases of the Fœtus*, i. p. 220, 1892.

cases of fœtal dropsy in the lower animals, as L. Franck[1] tells us in his paper on a calf with general anasarca. It is probable, however, that "calf" in "moon-calf" does not mean the young of the cow, but a thick fleshy substance like the calf of the leg. Whatever may be the origin of the word, it certainly suggests a belief in lunar influence upon the fœtus.

Such were the theories of the supernatural which our ancestors used to explain the occurrence of teratological phenomena, and whilst their very enumeration brings a smile to the face of the modern scientist, their existence was a very real thing to the people of the Middle Ages,—so real that death itself, and that of the cruellest kind, might be the fate of the unfortunate mother of a deformed infant. It must not be forgotten, also, that even at the present day traces of these early superstitions are to be found not only amongst savage races, but also in our own land and in the popular mind.

The President proposed a vote of thanks to Dr J. W. Ballantyne for his interesting communication.

MEETING II.—DECEMBER 11, 1895.

Dr BALLANTYNE, Dalkeith, *President, in the Chair.*

I. THE following gentlemen were elected Ordinary Fellows of the Society:—W. Macrae Taylor, M.B. C.M., 12 Melville Street; D. J. Graham, M.B. C.M., Maternity Hospital; W. W. Chipman, B.A., M.B. C.M., Royal Infirmary.

II. *Prof. Simpson* showed—(*a.*) AN EXOMPHALIC FŒTUS which had been sent to him by Dr Macleod of Shanghai. It had been born prematurely between the seventh and eighth month, and when Dr Macleod was called to attend at the labour he found some hæmorrhage going on, and through the imperfectly expanded os found that there was partial placenta prævia. In the further progress of the case the conditions were such as he (Prof. Simpson) had shown, in a communication made to the Society ten or twelve years ago, to be common with exomphalos of a pronounced type. The fœtus was bent backward with the feet towards the nucha, and the part that was found presenting after the membranes were ruptured was the herniated mass. Delivery was effected by bringing down first one and then both of the feet, and so extracting the infant.

(*b.*) AN ANENCEPHALIC FŒTUS WITH SPINA BIFIDA extending

[1] Franck (L.), "Zur Kenntniss der sogenannten Wasserkalber," *Deutsche Zeitschrift für Thiermedicin*, v. p. 82, 1879.

through the cervical and dorsal vertebræ. Dr Morgan of Pontypridd, who had kindly sent the preparation, had indicated that it was the second child produced by a woman, æt. 34, who is the subject of goitre, and has two brothers of feeble intellectual development—one of them, indeed, being a harmless idiot who has the habit of keeping his tongue protruded all day long. Labour set in at the seventh month of pregnancy with strong pains and hæmorrhage, which was found to be due to lateral placenta prævia. The head presented, and rupture of the membranes was followed by the escape of an immense quantity of liquor amnii. The placenta was small; the cord 36 inches in length. This patient's first pregnancy also terminated in the birth, at the sixth month, of an anencephalic fœtus with extensive spina bifida. She was not aware of any mental disturbance during her first pregnancy, but avers that during her last pregnancy the idiot brother made a very deep impression on her one evening by rapid protrusions of his tongue accompanied with other grimaces. During his six years' practice in the same district among a mining population, Dr Morgan has met with four cases of this variety of monstrosity.

(*c.*) A FŒTUS WITH DEFORMITIES OF THE LIMBS, from the extern practice of the Maternity.

III. *Dr Felkin* showed a new form of SAFETY-PIN, patented by Mr Robb, Kincardine O'Neill.

IV. *Dr F. W. N. Haultain* showed—(*a.*) A specimen of HÆMATOMA OF THE OVARY removed from a patient, who offered the following interesting history:—B. S., 24 years of age, unmarried, suffered from symptoms of pelvic trouble for four years. Two years ago she had a very severe pain in her right side, which, though it was improved at the time by vaginal douching, etc., had remained constant ever since. Six weeks before coming under my care patient had a similar, though more severe pain in her left side, which had incapacitated her from work ever since, and for which the usual remedies had been applied without effect. Her temperature was subject to marked variations, occasionally rising to 103° F. Vaginal examination revealed enlarged and tender ovaries, that on the left side being so exceptionally tender that palpation without an anæsthetic was impracticable. Abscess of left ovary was diagnosed, and oöphorectomy performed. The left ovary was found enlarged, and on section shows in its centre a firm, well-defined blood-clot, about the size of a pigeon's egg, evidently due to the extravasation of blood into a cyst. This origin was corroborated by microscopic examination. The right ovary shows a large cyst containing granular débris, probably also the remains of a previous hæmatoma. Since removal patient has been relieved of all pain, and is able to work as usual.

(*b.*) A specimen of probable OVARIAN HYDROCELE he had acquired

post-mortem from a patient who died of cardiac disease, and in whom no symptoms of pelvic trouble had been complained of. The entire internal generative organs had been removed. On the left side of the uterus was a cyst, evidently filled with darkish fluid, to which the ovary was attached, and in which the left tube terminated. On the right side was a smaller cyst, apparently situated between the layers of the broad ligament, and as there was no fimbriated extremity of the right Fallopian tube, it was probable that it opened into this also. On close examination of the large cyst, it certainly at first sight presented the characteristics of a distended Fallopian tube, offering, as it did at one point, the peculiar roseate appearance derived from the agglutination of the fimbriæ in these cases; and, indeed, if one looked at this side only, one would certainly declare it to be a simple tubal distension. But when taken in relation to the conditions met with on the other side, where the tube, though undistended, was evidently continuous with the small, apparently intra-ligamentary cyst, it appeared probable that one had to deal with a double ovarian hydrocele. The relations of the large cyst coincided closely with the drawing of this condition described by Bland Sutton on page 113 of his book on *Surgical Diseases of the Ovaries and Fallopian Tubes.* Should it be an ovarian hydrocele, the case was of great interest, as the woman had had one child twenty years before her death, and therefore it must be evident that a Graafian follicle must have ruptured into the hydrocele sac. He might add that he had previously carefully examined a similar condition, in which an extensive hæmorrhage had distended the sac, the blood arising from a separated tubal mole. In this case it is probable the patient would have died of intra-peritoneal hæmorrhage if the sac had not been present.

(*c.*) Two specimens of SIMPLE AMNIOTIC SACS, as described fully in his paper on "A Rare Form of Abortion"—which appears at page 48 in the present volume.

V. *Dr J. W. Ballantyne* exhibited—(*a.*) The PHOTOGRAPH OF A DICEPHALIC FŒTUS, which had been kindly sent to him by Dr J. F. G. Pallarés of Lorca, in Murcia, Spain. Two-headed fœtuses are rare, and the one in question was the result of a labour complicated by placenta prævia; the hæmorrhage was so considerable that delivery had to be hastened artificially, and the monstrosity was born dead. There was a single placenta and umbilical cord. There were two perfectly developed and separate heads, each having its own neck; below this the trunk was single externally, and there were only two arms. Dissection showed that there were two incomplete thoraces and a double respiratory apparatus, but there was a single heart. The digestive apparatus also was single, as were the other abdominal viscera. There was a single penis and scrotum, and two lower limbs. From the appearance of the

scrotum it would seem that the fœtus was born breech first. This double fœtus belonged to the variety *dicephalus*, to the group *somatopagus*, and the sub-group *dipus dibrachius*.

(*b*.) The PHOTOGRAPH OF AN INFANT WITH CONGENITAL ELEPHANTIASIS, which Dr Moncorvo of Rio (Brazil) had kindly sent to him, along with an account of the case, of which the following was a translation and summary:—The infant, a male of mixed race, was born at Rio de Janeiro, and first seen by Dr Moncorvo in May 1895. He was then five months old. The father, a half-breed, had suffered from acquired syphilis, and on several occasions had had lymphangitic attacks affecting the limbs, and specially the arms. The mother, also a half-breed, had usually enjoyed good health. She had had seven children, of whom four (the first, second, fourth, and fifth) were already dead. Whilst nursing her second last infant she had been attacked by lymphangitis in the left breast, going on to suppuration. During the last pregnancy she had had several falls, followed by more or less troublesome results. The first, a fall in the street, with bruising of the abdomen, at the fourth month, had been followed for eight days by abdominal pains. Two months later the abdomen was bruised again by a second traumatism; this was succeeded by abdominal pain, a rigor, and rise in temperature. At the seventh month she fell across the tramway rails in the street, again bruising the hypogastrium, which became the seat of a lymphangitic attack, going on to suppuration and fever of a remittent type, and lasting about a week. Again, at the eighth month, she received a blow in the abdomen, followed by slight pains. Labour took place normally at the full term, and it was at once noticed that whilst the infant was alive and active, he had an abnormally large right lower limb. None of the other children had had the like, nor had they been attacked with erysipelas or lymphangitis. The infant, who was nursed by his mother, was well nourished, slept well, and did not seem to suffer any pain: but he showed signs of hereditary syphilis (coryza, enlarged glands, etc.). There was marked hypertrophy of the right lower limb from foot to groin, which was most marked in the foot and lower two-thirds of the leg, and there were deep grooves to be recognised. The skin was smooth and of normal colour and temperature, but drier than that in other regions, and firmly adherent to the subcutaneous tissue. Palpation revealed a feeling of elastic hardness of the tissues, more marked on the dorsum of the foot, less so on the thigh. The circumferential measurements of the right thigh were about 2 cms. greater than those of the left, whilst those of the leg and foot were from 4 to 6 cms. greater in the right than in the left limb (*e.g.*, the circumference at the right ankle was 19 cms., that at the left 13 cms.). Sensibility to touch and the reaction to electricity were less marked in the right than in the left leg. The microscopic examination of the mother's blood showed only a slight exaggera-

tion of the number of leucocytes, whilst blood serum taken from the lower third of the right leg of the infant revealed the presence of a certain number of the streptococci of Fehleisen, either single or grouped, as diplococci or in chains (method of Ziehl was used to demonstrate them). The infant was put on a course of iodide of potassium, and the limb was subjected to elastic compression, with the result (after a week) that the dimensions of the hypertrophied extremity were considerably reduced. The treatment was interrupted by an attack of malaria and diarrhœa, requiring appropriate therapeusis. The galvanic current was used later to hasten the softening of the subcutaneous tissue. This was the tenth case of the kind that Dr Moncorvo had seen, and he regarded it as supporting the theory of pathogenesis which he had advanced to explain such morbid states. He believed they were due to the passage of the streptococcus of Fehleisen into the fœtal organism through the placental circulation. In this case the mother during her pregnancy had had four lymphangitic attacks of traumatic origin, and in the blood of the infant there were found the streptococci of Fehleisen, although he (the infant) had never since his birth had either lymphangitis or erysipelas. According to this theory the elephantiatic new formation, produced during fœtal life, often arises from a lymphangitic process set up by streptococci coming from the maternal circulation.

VI. MITTELSCHMERZ.

By J. Halliday Croom, M.D., F.R.C.P. Ed., F.R.S.E., Physician to the Royal Maternity Hospital; Physician to, and Clinical Lecturer on Diseases of Women, Royal Infirmary; Lecturer on Midwifery and Diseases of Women, School of Medicine, Edinburgh.

(*Communicated by* Dr Haultain.)

I do not propose to enter into a general discussion of dysmenorrhœa. The object of the present communication is to discuss a form of dysmenorrhœa, by courtesy so called, which occurs, not at the period when the external manifestation of menstruation takes place, but at mid-term,—a condition to which the Germans have given an appropriate name, "Mittelschmerz," and which the French have, less felicitously, called "Dysménorrhée intermenstruelle." Whatever name may be applied to it—and certainly intermenstrual dysmenorrhœa is not suitable—the condition is a well-marked one, wherein an attack of dysmenorrhœa proper is simulated, without, necessarily, any external hæmorrhage. It does not at all resemble the pre-menstrual pain, or the continued pain associated with inflamed or diseased ovaries, but it is a condition which occurs definitely each month, at a definite period, and for a definite number of days.

So far as I am aware, the condition was first of all described by

Sir William Priestly many years ago, and it has been also discussed by Fasbender and Sorel.

I will now recount the more important points of a case occurring in my own experience, which may be taken as fairly typical. It was that of a young girl of 18 years of age, whom I first saw at Prof. Simpson's private clinique somewhere about the year 1873. She complained of acute pain, sometimes in one side and sometimes in the other, occurring with the utmost regularity, fourteen or fifteen days after her menstruation. This had been the case ever since she was 14, and she did not begin to menstruate until she was 16. There was no abnormality, so far as I could discover, in the ovaries, tubes, or uterus. I saw her more or less regularly for thirteen or fourteen years after she first came under my observation.

During all that time she menstruated with regularity, and her intermenstrual sufferings continued. During the years I knew her she occupied various situations in the capacity of a housemaid. She menstruated regularly and without pain, but every month she was obliged, in order to avoid her intermenstrual suffering, to use morphia rather freely. She ultimately married and went to the Colonies, and I know nothing of her subsequent history. Her pain began after a very severe attack of scarlet fever when she was about 14 years old.

The second striking case that has come under my personal observation was that of a woman who was sent to my ward for profuse hæmorrhage, associated with marked dysmenorrhœa, in addition to a definite and severe pain occurring between the menstrual periods, about the fifteenth day. The pain was severe and localised to the left side, and accompanied occasionally, though not always, by a slight discharge, sometimes of blood, and sometimes of clear fluid. On examination she was found to have a uterus enlarged to 3½ inches, and containing a submucous fibroid on the right side.

After continued treatment, including curetting, she was sent home, but returned in a few months with the symptoms all considerably aggravated. It was resolved, therefore, with a view to checking the hæmorrhage, which had become so profuse as to prevent the patient continuing her duties, to remove her appendages. This was done; the right ovary was somewhat cystic and the tube thickened; on the left side the ovary was normal, but there was a well-marked hydrosalpinx. It is worthy of note, as bearing directly upon the case, that the woman was 35 years of age, and she had suffered from intermenstrual pain only for five years. It will therefore be seen that this case differed entirely from the last one, in which the condition of intermenstrual pain had existed from childhood.

Two things, consequently, are clear about this case,—first, that the condition was distinctly an acquired one. Were it due to some condition of the ovary, then the Mittelschmerz should have

been on the right side, whereas the pain was on the left, where the ovary was normal. Secondly, if it were due to painful ovulation occurring independently of menstruation, then it would have been expected that the intermenstrual pain would not have been of such recent origin. It is therefore by no means unlikely that this rare condition may be due to the over-distension of the Fallopian tube with fluid, and that the pain of the Mittelschmerz is associated with its expulsion.

This question of hydrops tubæ profluens I shall discuss later on.

Case 3.—A woman, 25 years of age, was brought to St Luke's Home some years ago suffering from severe dysmenorrhœa, the dysmenorrhœa occurring for the first three days of the menstrual period. Various remedies were prescribed, but she returned to the Home some months afterwards, being no better. A local examination was then made, when it was found that the uterus was somewhat enlarged and acutely retroflexed. The condition of the appendages was apparently normal.

During her stay in the Home, which was rather protracted, and before any operative interference had been undertaken, my attention was drawn to her having acute suffering in the left side, about fifteen days after menstruation, very similar to the pain she suffered at her menstrual period, but not so severe.

I examined her then, and found the condition in the pelvis as I have described, with the addition that there was a distinct fulness at the left side, the nature of which, at the time, I did not recognise.

On further inquiry, I found that she had had this mid-term pain, lasting for a few hours, regularly for four or five years.

With a view to curing her dysmenorrhœa the cervix uteri was dilated, and she was sent off in the hope that her dysmenorrhœa would be relieved.

Months later she was brought back again by her mistress, who said she was quite unfit for her duties as a servant, and must therefore, unless cured, leave her situation, all the more so as twice in the month she was temporarily *hors de combat.*

I am not perfectly sure what the further treatment was which she underwent for her dysmenorrhœa, but, whatever it was, it was unavailing.

The case was brought to me after I came to be in charge of beds in the Infirmary, and after carefully considering the matter with the doctor in whose charge the patient had been, I somewhat unwillingly removed the ovaries. I found that there was well-marked hydrosalpinx of the left tube. The fact that this condition of the hydrosalpinx, of the size of a small hen's egg, was not found except on the one occasion referred to above, led me to the conclusion that it was one of those cases of hydrops tubæ profluens, and this conclusion was entirely supported by the subsequent history of the case; because, although the removal of her ovaries and tubes neither stopped her menstruation nor cured the dys-

menorrhœa, the intermenstrual pain did not recur for at least a year afterwards, since which time I have not heard of the case again.

The four cases recorded by Priestly in the *British Medical Journal* for 1872, which appear to be the earliest recorded cases presenting this condition, have the following as their prominent features:—Pain, paroxysmal, in the region of the ovary, occurring during the intermenstrual period; in some cases continuing up to the commencement of the flow, in others stopping before then. The ordinary flow is usually scanty, but regular, and with no pain.

On Bimanual Examination.—In two cases tumour felt in region of broad ligament, adherent to uterus, elastic to touch.

In the other two cases only thickening in the region of the broad ligament.

Sorel records a case, presenting symptoms similar to those mentioned above, in which the condition existed for a great number of years; indeed, observation had been made during a period in which 147 menstrual epochs had occurred. The chief conclusion arrived at by this author was that the occurrence of the intermenstrual pain bore a more definite relation to the commencement of the period which followed it than to the period which went before, as there always elapsed fourteen days between the occurrence of the pain and the commencement of the menstrual period.

One of the most important contributions to the very limited literature of this subject is an article by Heinrich Fasbender, published in 1876, in the *Zeitschrift für Geburtshülfe und Frauenkrankheiten.* The case, which he quotes as having occurred in his own experience, presents the following features:—

An unmarried woman of 24, anæmic, with an anxious cast of countenance, had menstruated regularly since her fourteenth year. The flow was always sparing, and for a few days before its appearance there was a severe pain in the lower part of her abdomen, with gastric disorder, cachexia, and alternate sensations of heat and cold. For the past two years there had occurred, at the fourteenth to sixteenth day after menstruation, a disorder similar to that which accompanied the ordinary menstrual period, accompanied by a flow of mucus from the vagina so conspicuous as to have caused her to mention it without its being suggested to her. Her nervous system had become much affected by the pain and discomfort which she underwent, so much so as to have produced symptoms of hysteria and a mental condition bordering on melancholia.

Physical examination showed the presence of an acute anteflexion of the uterus, with chronic endometritis and colpitis, with lesions of the os. Nothing abnormal was found in the uterine annexa. On seeing her again at the time of her intermenstrual pain, he came to the conclusion that the mucous discharge was most

copious when the feeling of heaviness in the pelvis was most marked, pointing to a congestion in the pelvic organs. Fasbender's view of the etiology of Mittelschmerz is that, accepting Pflüger's theory of menstruation, we have in some cases a premature summation of nervous stimuli in the ovary, with the occurrence of ovulation, caused either by a delicately organised and excitable state of the whole nervous system or of the nerves of the ovary, the latter state produced by a pathological condition of the ovary. This abnormal irritability leading to dehiscence of a follicle, some fourteen days before the proper menstrual period, produces the congestive condition of the pelvic organs found in cases examined at such a time.

In the discussion which followed the reading of Herr Fasbender's paper several additional cases were cited and opinions expressed.

Two gentlemen cited cases where the intermenstrual pain had occurred in women suffering from anteflexion of the uterus; and a third suggested the anteflexion as the cause of the Mittelschmerz, the pain being due to contraction of the uterus, trying to expel retained blood, etc. To this it was replied that in the observed cases no contractions of the uterus could be discovered, and further, anteflexion was not present in all cases of Mittelschmerz, while if it were caused by anteflexion, Mittelschmerz would be a much commoner symptom than it is.

Mittelschmerz with a slight flow of blood is also described by Herr Benicke as occurring in a case where there was a conical cervix with pinhole os, anteflexion of the uterus, and retraction of the utero-sacral ligament.

From the above notes, which, so far as I can discover, include a mention of nearly every case of Mittelschmerz which has been recorded, the condition, it seems to me, can be well considered as having three different manifestations.

1. A group of cases in which there is no external manifestation at all.

2. Those cases where the pain is associated with an escape of blood.

3. Those in which, as in two of my cases and some of the others, the intermenstrual pain is associated with a clear discharge.

It would be absurd to dogmatize upon the causes which give rise to this condition, or to lay down any hard and fast rules as to the pathological conditions necessary to its production, but it seems to me that the above classification gives a fair insight into the different states that may lead to the production of this somewhat unusual symptom.

(1.) With regard to those cases where no external manifestation accompanies the occurrence of Mittelschmerz, the explanation is probably to be found in the fact that ovulation and menstruation do not in these cases occur simultaneously; that, in addition,

owing to thickening of the capsule of the ovary, or some such cause, dehiscence of the follicle occurs with pain.

(2.) Those associated with escape of blood. In all of these it will be observed that there was present more or less endometritis, anteflexion, and enlargement of the uterus, and, so far as I am able to judge, these were simply cases in which a slight intermenstrual flow, due to endometritis, was accompanied by well-marked pain during the passage of clots. Such a condition is well recognised and common, and scarcely, I think, should come under the category of Mittelschmerz at all. Still, it adequately enough describes a set of cases to which the Germans especially have drawn attention.

Lastly, with regard to those cases in which a leucorrhœal discharge is described as occurring with the Mittelschmerz, and where, just before the usual date of the occurrence of the pain, a swollen and fluctuating condition of the tubes was in some cases made out, I think there can be no question that the cause of the intermenstrual pain was to be found in hydrops Fallopii, reaching its full development at mid-term.

I am well aware that much doubt is now thrown upon the possibility of the existence of what is called "intermitting hydrosalpinx" or "hydrops tubæ profluens," the occasional sudden escape of fluid through a temporarily patent uterine end, with disappearance and diminution in size of the tubal dilatation. According to some, it is much more likely that these discharges pass, not through the cervix, but by a vaginal fistula communicating with the cyst. Either explanation is compatible with this view of mine.

In my case, in which a removal of the tubes and ovaries brought about a cessation of the Mittelschmerz, it may be urged that the pain had been ovarian, and that the removal of the hydrops did not lead to its cessation, but the removal of the ovary. Here I would remind you that colicky pain in the tubes in such a condition occurs, contractions of the sac forcing the fluid through a uterine orifice only partially closed; and also that pain may be due to discharge of uterine contents, the result of reflex contraction of a necessarily congested uterus. Thus it is more than likely that the pain was really tubal.

Prof. Simpson agreed with the President in regarding this as an able and very interesting communication. That the literature on this subject was scanty was probably due to the circumstance that the patients who suffered from intermediate pains usually suffered also from other pelvic distress, so that the special symptom did not receive special attention. Dr Croom had done a good service in directing attention to it and in relating such instructive cases. He (Prof. Simpson) believed that Dr Croom was correct in attributing the symptoms to tubal distension, which,

however, was very apt to be associated with ovarian inflammation; and in cases that had come under his observation the measures that had been serviceable in dealing with salpingo-oöphoritis had succeeded in relieving this symptom also.

Dr Milne Murray agreed with Professor Simpson as to the interest of Dr Croom's paper. He was also at one with him as to the comparative frequency of these cases of "middle pain." He had met with several in his practice. One of the earliest he had observed was that of a young unmarried lady who had been a patient of Dr W. L. Reid of Glasgow. Dr Reid had treated her for an attack of endometritis with enlargement of the uterus and retroversion. When she came under Dr Murray's observation the endometritis was almost cured, and she was wearing a pessary. She then complained chiefly of what she herself termed her "middle pain," which came on exactly fourteen days after the commencement of her period. The pain was intense, referred sometimes to one side, sometimes to the other, and was associated with great headache and prostration. It was most acute on the second day, and generally ceased suddenly. The only relief she obtained was by the use of very large doses of bromide of potash, which induced a sort of stupor. In this case nothing abnormal could be found in either tubes or ovaries,—the latter being not more sensitive than usual. At the time of the pain they were, however, very sensitive on examination. The steady use of the hot douche seemed to diminish the suffering considerably after some months. Some time after this her endometritic symptoms were aggravated by the effects of exposure to wet and cold, and she began to suffer from great dysmenorrhœa, and after simple remedies had been exhausted, the cervix was dilated, the cavity curetted and cauterised. This quite relieved the dysmenorrhœa, but the "middle pain" still continues, though on the whole it is less severe than at first. Another case which he saw recently is of more physiological interest. The patient is a married lady 32 years of age, and the mother of four children. Her periods are quite normal, both as to amount, sensation, and regularity, but on the fourteenth day after their commencement she is seized with a violent pain in the lower part of the abdomen, which lasts always for two, sometimes for three days. She is compelled to lie down for a part of the time. The pain generally ceases suddenly. She experienced this before her marriage for three or four years at least. On examination the pelvis seems quite normal in every way. A point of special interest is that all her four children have been born a fortnight before the calculated time, and she states that the only time she experiences sexual pleasure is for a day or two after the pain ceases, this being quite absent at all other times. Dr Murray could not help thinking that this pain was connected in all cases with the process of ovulation. In the last case this seems strongly borne out; and even in the cases cited by Dr

Croom, where there was evidence of tubal distension, it seems essential to postulate some recurring process such as ovulation to provide the nervous or muscular tension necessary to effect the evacuation of the tube. Without this it is difficult to see how the periodic discharge of the contents would be brought about. It seemed to him that the occurrence of ovulation at a period midway between the menstrual processes was sufficient to account for the pain both in those cases where a gross lesion could be detected, and also in those where no such condition could be determined.

Dr J. W. Ballantyne thought a possible cause of severe intermenstrual pain might in certain instances be found in the presence of a double uterus, one of whose horns was imperforate, for it was well known that in the bicornate and didelphic organ menstruation might occur once a fortnight, the blood coming from one cavity one fortnight, and from the other the next. If one of the uterine cavities did not communicate with the vagina, then there might be an intermenstrual pain without any visible hæmorrhage. He did not quite agree with Dr Croom that it was best to adopt the German name for this condition. He thought that intermediate pain or dolor intermedius menstrualis were in some ways preferable.

Dr Haultain agreed with Dr Milne Murray in attributing the Mittelschmerz in the majority of instances to ovarian origin, and most probably to ovulation. Its marked periodicity was indicative of such an origin, and cases were by no means uncommon where periodic pain was complained of a few days before or after the period, which was to be accounted for on similar grounds. In fact, when ovulation or menstruation were not coincident in women suffering from inflamed and tender ovaries, such a condition must be expected.

Dr James Ritchie felt much interest in Dr Croom's paper as helping to elucidate an obscure subject, and also because he had, in the cases which had come under his own observation, adopted a different theory to explain the phenomenon in question. Menstruation was due to a discharge of nerve energy towards the uterus and its appendages. There were evidences that this discharge might take place independently of ovarian activity. The cycle of menstruation was usually about twenty-eight days, but Dr James Ritchie believed that there was an intermediate discharge of nerve influence of variable degree, and that the middle pain was induced in that way by mechanism similar to that which produced it at the monthly time. His reasons for believing that this nerve discharge existed, and that it might be the primary cause of the pain, was derived from three considerations. 1. In certain abnormal conditions of the cervix there was a discharge of blood at the middle of the period. 2. That if labour did not set in at the tenth cycle calculated from the last period it was often delayed for fourteen days, and in some cases happened fourteen days before

the tenth cycle. 3. When a woman did not nurse, and even in some cases of subinvolution of the uterus while she was nursing, the catamenia reappeared six weeks after confinement.

VII. EXPERIMENTAL RESEARCH INTO THE ACTION OF *VIBURNUM PRUNIFOLIUM* (*BLACK HAW*).

By THEODORE SHENNAN, M.D., Pathologist to the Leith Hospital.

VIBURNUM PRUNIFOLIUM was first brought into notice in the United States of America, attention being drawn to it by tales of its virtues current on the plantations. Among the negro population it was believed that had a woman eaten the berries or drunk of the infusion made from the root-bark, it was impossible to make her abort, even though this were tried with criminal intent. Allowing for exaggeration common to the negro mind, it seemed to be worth while to make a proper extract, and apply it in skilled hands as an agent for prevention of abortion or premature labour.

Summary of Literature.

The literature of Viburnum prunifolium is almost wholly clinical, and as such it is difficult to draw conclusions as to its physiological actions.

Dr Phares of Newtonia, Miss., has the credit of initiating its use. His paper, published in 1866, recommended it as astringent, diuretic, tonic, antispasmodic, but chiefly as a remedy for dysmenorrhœa and as a preventive of abortion.

Little more is heard of it until 1876, when Dr Jenks, of Detroit, revived its use. He employed it in menorrhagia, metrorrhagia, and dysmenorrhœa with menorrhagia. He attributed a great deal of its value to the presence of a body similar to valerianic acid.

Rockwell, 1879, used it in dysmenorrhœa. He considered it was indicated in delicate, nervous women in whom pain is due to slight anteflexion, slight endocervicitis, partial stenosis, or where it is neuralgic in character. He classed it as anodyne, antispasmodic, and tonic. The last term, to my mind, is very indefinite, though in one of my cases I noticed a relief of nausea or sickness, which relief followed the administration of viburnum.

Abbot, 1879, used it in dysmenorrhœa with great success, as also Curtis (1879) and Lyman.

Chadwick, 1879, found it give relief in many cases, but success was not invariable, or as brilliant as previous papers had led him to anticipate. Its action was similar to, but not superior to that of zinc valerianate.

J. H. Wilson of Liverpool, 1885, seems to have introduced it into this country. He found it useless in syphilitic cases, or where the placenta was fatty, or when the os was gaping and the ovum presenting. He found it beneficial in habitual abortion,

and even in cases where there were pains and hæmorrhage with dilated external os, and suspicions of partial separation of the ovum. It was not necessary to keep the patient in the recumbent position for more than a few days.

M'Fie Campbell, 1886, used it in threatened abortion, preferring it to opium or ergot, which often disappoint in their action, the former being frequently followed by expulsive pains, and the latter by a prolonged calm.

Leith-Napier, 1886, after reviewing some cases—*e.g.*, menorrhagia, dysmenorrhœa, abortion—treated with viburnum, concluded that it was preventive in habitual abortion, if given with a view to regulate uterine action, rather than as an arrester of the immediate cause of abortion; but he had had as good results with other drugs, *e.g.*, potassium chlorate.

W. E. Green, 1886, refers to a note by Dr Roe of Beachville, Illin., in the *Americ. Therap. Gaz.*, 1883. This is the description of how a woman, after repeated abortions, was enabled by use of viburnum to proceed to term, though there was a serious attempt at abortion.

Dr I. M. L'voff, 1886, describes fifteen cases (non-syphilitic) of attempted abortion treated with viburnum. Nine of these were habitual, and all were successful. In the six other cases there were already signs of impending abortion,—hæmorrhage, shortening of cervix, dilatation of os, and slight spasmodic pains in the uterus. They were also successful. Many of the women were poor and had to attend to their household duties.

Roberts, 1887, describes the case of a lady, an habitual aborter, who, by using viburnum, was enabled to go to term and be delivered of a living child.

Auvard, 1887, used a strong tincture as a uterine sedative, calming and arresting uterine pains. He found that—

1. When the waters were broken, even at the 6–7 months, the fœtus could be retained.

2. The fœtus could be retained even if dead.

3. It was useful in abortion or premature labour, even where the mother had severe intercurrent illness.

4. In post-partum pains, whether the uterus contained clots or not, it acted as a sedative, so that its use might be fraught with danger in the puerperium, unless in addition there were careful uterine douching with a two-way catheter.

5. In Gynæcology—in dysmenorrhœa, and the hæmorrhages of the menopause.

6. In colicky diarrhœa, probably by quieting the contractions of the muscular walls of the intestine.

7. Locally, in conjunctivitis, aphthæ, chronic diarrhœa, dysentery, indolent ulcers, probably owing to the tannin contained.

He prefers it to opium, which, though equally effective, has its dangers.

Schatz, 1888.—It cannot be so often employed as hydrastis; useful in habitual abortion; better than opium or bromide of potass, though opium was required when strong pains had already begun. He found cases where, by use of viburnum, dead ova were retained in the uterus for months. It does not act quickly or powerfully enough to be applicable in cases of labour coming on suddenly. He thinks that it acts by stimulating inhibitory nervous centre of uterus.

Payne, R. L., read a paper on Viburnum prunifolium before the Medical Society of North Carolina, 1888, from which I extract the following. This is one of the few papers which treat the subject scientifically, and describe experiments carried out on the lower animals. He refers to the literature of viburnum, and the want of definite rules for its use. He experimented with the ordinary alcoholic liquid extract; or with the solid extract rubbed up with water, with the view of getting rid of the vitiating effects of the alcohol contained in the fluid extract. He found that both had a similar effect. His results were as follows:—Paralysis, loss of reflex motion, both with mechanical and chemical stimuli. He got reactions with electrical stimuli—whether faradic or galvanic it is not stated—one pole to the spine, the other to the limb. He gave as much as ʒiv. of the fluid extract to rabbits, and the amount of alcohol contained must undoubtedly have had an effect on the tracing. I think that my experiments on rabbits prove this. In rabbits (solid extract used, rubbed up with water), the blood-pressure was found to fall very rapidly after injection of a syringeful into the jugular vein. I have also to find fault here, in that evidently no care had been taken to make the fluid neutral or slightly alkaline, and that the resins, which are present in considerable quantity, were not removed before injection. His tracings show a marked effect on blood-pressure, but at parts suggest, by the weakness of the heart curves, that there may have been some clotting in the cannulæ. There was evidently no balancing of pressure in the vessels by use of a column of mercury, and as the blood was thus allowed to pass for some distance into the tube leading to the recording apparatus, the tendency was for it to clot. I found this clotting to be very troublesome in my own experiments.

He concluded that "there was no effect on sensibility. The chief action was on motion, paralysis, loss of voluntary motion, loss of reflex power, the extent being governed entirely by the amount of the drug used. The pupils contracted in cold-blooded, did not change in warm-blooded animals. Muscular irritability lost after lethal doses, but nerve conduction lost before muscular contractility. Probably the action was chiefly on the spinal cord and its posterior columns. The heart quick and feeble, blood-pressure lowered; in lethal doses heart stops before respiration."

He recommends its use in diseases with increased excitability of the motor centres,—hysteria, hystero-epilepsy, *petit mal;* in paralysis agitans, the dysmenorrhœa sometimes designated ovarian or spasmodic. He asserted that it is harmful in menorrhagia due to congestion of portal circulation, subinvolution of uterus, metritis, erosions of cervix, fibroid tumours. It is preventive in abortion, and very useful in habitual abortion. It has a paralyzant action on the uterus.

J. Hinton, Detroit, 1889, applied it for the control of false pains, and even of labour pains. He has never observed post-partum hæmorrhage or severe after-pains when using this drug.

Parker used it for the irregularities of menstruation.

Joseph, of Landeck, in Schlesien, has an important paper on the subject. He recommends it very strongly in virginal dysmenorrhœa. He used it in two cases of habitual abortion, which were unsuccessful; but he does not consider this sufficient trial. Of the forms of dysmenorrhœa, that is most relieved which is brought about by mechanical obstruction; for example, congenital or acquired anteflexion, as opposed to congestive dysmenorrhœa, which is more common in married women. The amount of the flux was diminished, and sank to normal; moreover, the remedy changed the interrupted course to one more continuous. He recommends it as an antispasmodic, and not only in uterine or intestinal colic, but also in other conditions of cramp, such as of voluntary muscles.

Such are the more important papers which have appeared on the subject.

I may supplement these with a few cases taken from a brochure containing reports on the use of Viburnum prunifolium, which Messrs Parke, Davis, & Co., of Chicago, sent me.

Dr Boal prefers viburnum to opium in many cases, as more easily borne and readily retained by the stomach. It is very beneficial in spasmodic dysmenorrhœa, curing the patient, and gives relief when dysmenorrhœa is due to flexion or stenosis. It relieves pain preceding and during menstruation, which are generally treated with opium or alcohol. Even if this one action were proved, and it were able to take the place of these powerful remedies, and so prevent the formation of the opium or alcohol habit, viburnum would be very serviceable.

Blackerby used it in habitual abortion, and cites a very conclusive case. A patient of his had had six abortions. Viburnum was administered during the whole of the seventh pregnancy, which went to term, and ended in the birth of a living child. The eighth pregnancy had a similar result under similar treatment, but the ninth ended at the seventh or eighth month, and Dr Blackerby found that viburnum had been given up, on the assumption that it had had nothing to do with the previous results. It is useful also in preventing abortion after injury.

Roe.—Great relief obtained in false pains, with bearing-down

and frequent desire to micturate and defæcate. After-pains are readily stopped.

The report by Dr Griffin of Louisiana is of great interest. He was going to administer fluid extract of Viburnum prunifolium to a patient who was threatened with abortion after an accident. Her mother-in-law remarked that if she had the patient at her home she would not have much difficulty in stopping the abortion. On being questioned as to what her treatment would be, she replied that it would be administration of a tea made from the roots of the black haw.

Houston considers Viburnum prunifolium useful in irritable uterus, due to nervous action caused by over-exertion, fright, mental worry. Benefit is often increased by adding tincture of valerian or ammonium valerianate.

Many other cases are related which I need not further specify, where relief has been obtained in threatening abortion after over-exertion, *e.g.*, at the wash-tub, or from too much horseback exercise, or after falls and other injuries. The sources of these various papers are indicated in the list of authors.

Indications for the use of VIBURNUM PRUNIFOLIUM.

In *habitual abortion*, where this is not caused by syphilitic infection or by fatty placenta, there seem, undoubtedly, good results to follow the use of Viburnum prunifolium.

In *threatening abortion*, however caused, and at any period of gestation, if the case is got soon enough, it seems to be very successful.

In *dysmenorrhœa*, if functional, spasmodic, or ovarian, or attended with menorrhagia, it often cures. If there is flexion or stenosis, it gives great relief, though, of course, it cannot cure.

In the menorrhagias and metrorrhagia of the *menopause* and in the nervous disorders of that time it is very beneficial.

After-pains are so readily relieved by it, that some (*e.g.*, Auvard) consider that its use is dangerous unless all clots are cleared out of the uterus previously.

It may be used in the diagnosis of *false pains*, speedily relieving them.

It is also used with success in *colicky diarrhœa* and in *dysentery*. Some even claim that it has a curative effect on cramps of voluntary muscles.

Botanical Description.

We may speak of Viburnum as a class of which there are many species. They are generally tree-like shrubs, with beautiful white or rose-coloured flowers, and grow in temperate or cold parts of both continents—Europe and America—preferably in mountainous or wooded places.

There are about eighty known species, the great majority of which are of no great interest from a medical point of view. It will be interesting, however, at a later stage to refer to a few of them which, as they will be somewhat familiar and met with by ourselves, may, by the interest attached to them, cause greater interest to be taken in Viburnum prunifolium, the member of the group which I specially consider. Some of the other members of the group are also used medicinally.

Viburnum prunifolium is a shrub which sometimes becomes tree-like, beautiful from its foliage, and in spring from its white, clustering flowers. It may attain the height of 18 to 20 feet. It grows most luxuriantly in the Southern States of North America, on the banks of the Mississippi,—in Florida, Virginia, Carolina, and Texas. It is also found widespread, but of smaller size, in Canada. It is cultivated in Europe under the name *Black haw*, *Aubépine noire* (Fr.), as an ornamental shrub. The German *Schneeball*, American and English *Snowball*, is also very closely allied to it. It belongs to the class Caprifoliaceæ.

The trunk and root are four-angled. Branches opposite, or three to four whorled. The leaves are broadly oval, obtuse at both ends, finely and sharply serrate, shining above, and smooth below, with short, small marginate petioles. It flowers in May. The inflorescences are white, panicled, and have sometimes at their margins large, radiating sterile flowers. *Calyx*, short, five-notched, persistent. *Corona*, regular, five-lobate. *Authers*, introrse or extrorse, five *Stamens*. *Ovary*, unilocular, surmounted by one short conical style, with two or three stigmatiferous lobes. *Fruit*, drupaceous, oblong, unilocular, containing a very flat crustaceous stone, which, in turn, contains a single pendent seed.

The *root-bark* is officinal in the United States Pharmacopœia, and is the only part from which preparations are made. Externally it is glossy, purple-brown, or, when older, grey-brown, with warts and little black dots scattered over the surface.

The *corky* layer, of papery thinness, scales off from the green sublayer,—the inner bark containing chlorophyll. The *bast* part is white, and its inner surface smooth.

The bark is rather brittle, has a weakly astringent, slightly bitter taste, and has a musty valerian odour.

In other members of the group, cells containing crystals are absent in the primary bark, and in the bast filaments of the inner bark; but in these parts of the Viburnum prunifolium large crystal cells, either singly or in clusters, are present (also, according to Holfert, in the middle bark). The crystals are of calcium oxalate.

The *medullary sheaths* are in one or two rows.

I may now glance shortly at some of the varieties of Viburnum, closely related to Viburnum prunifolium, with which we are familiar.

Viburnum opulus or *Guelder* (Gueldres) Rose, also known as

—1, Schneeball; 2, Viorne obier or aubier; 3, Snowball tree; 4, Cranberry tree; 5, Cramp bark.

This is closely related to the Wayfaring tree, or Bog-Elder—Viburnum Lantana. It is very common in the British Isles, in Europe, and in temperate parts of Asia. It is a small shrub 6 to 12 ft. high, grows abundantly in wet woods, and flourishes in the middle of spring. If cut down it shoots again vigorously, and can cover marshy ground in a very short time. It is also used for hedges.

The leaves are smooth on the under surface, and three to five lobed. The flowers are small, white, and are arranged in large cymes. The outer flowers in each cyme are larger, and have neither stamen nor pistil.

In the cultivated variety all the flowers are changed in this way—barren—and the flattened cyme becomes a globular mass of white flowers, whence its common name of the Snowball tree. The leaves are much sought after by horses and hogs. The berries are red and juicy, and are eaten in spite of their astringency. In Sweden and Norway they are fermented with honey and flour before being used. A spirit is also distilled from them. The wood, white and soft, makes good charcoal for gunpowder. This variety of viburnum, on account of its great beauty, is used in ornamental landscape gardening (Larousse.)

Viburnum tinus.—Laurestinus, with its beautiful dark-green oval leaves, and its flowers white in the centre, red externally, arranged in corymbiform cymes, is much used in shrubberies. The fruit is said to be purgative.

Viburnum fœtidum is another species, more important medicinally than ornamentally. It is an Indian variety, and is considered valuable by the Hindu women as a hæmostatic agent in parturition. A wineglassful of the sap of the leaves is given. (Dymock.)

Viburnum odoratissima (Ker) or *Cassinoides* (Linn.) is used in China to make a theiform infusion.

There are many other varieties which have not sufficient interest to claim our attention.

Chemistry and Constituents.

Little satisfactory has been accomplished in this field, though several observers, notably Krämer and Van Allen, have turned their attention to it.

Krämer, in 1844, obtained from the bark of Viburnum opulus (Cranberry tree) viburnic acid, which has also been obtained from the bark of Viburnum prunifolium, and has since been identified with valerianic acid. He also extracted a bitter principle which he called "viburnin," but which was not proved to possess the characteristics of the bark *in toto.*

Herman van Allen obtained:—1. A resinous body of a very bitter taste, which contained sugar. 2. "Viburnin" of Krämer, a

greenish-yellow resin or natural principle of bitter taste, slightly soluble in water, freely in alcohol. 3. Valerianic acid. 4. Oxalic, citric, and malic acids. 5. Tannic acid. 6. Sulphates. 7. Chlorides of calcium, magnesium, potassium, and iron.

From my own work in this direction I found it very difficult to separate any distinct active principle. At least this much I may say, that I have obtained a body in solution—after processes calculated to remove all other substances except alkaloids, and not so severe in their action as to cause disintegration of any active principle—which gives precipitates with all the alkaloidal reagents in my possession, as I shall detail later, and which, in addition, has an action on the frog very similar to that of the whole drug (*v.* Experiment 16). It is just a question, however, whether there is not a combination of actions. The fluid extract, to a greater or less extent freed from alcohol, has been the preparation most generally used, with greatest and most uniform success. Now, this contains, in addition to the alkaloid, viburnic (*i.e.*, valerianic) acid, tannic acid, and other less important constituents. Though there may be a special action of the active principle, yet we must also credit the valerianic acid and the tannic acid, particularly the former, with some effect in treating patients, often excitable and hysterical, with this drug.

As a result of my investigations, by several different processes I separated a body giving alkaloidal reactions. This was a fawn-coloured syrupy substance. I obtained it only in small quantity, about ½ per cent. of the bark. When dissolved in absolute alcohol and dropped into ether, it was precipitated; but shortly after, the precipitate gathered as a syrupy layer on the bottom of the dish. It gave reactions with phosphomolybdic acid, phosphotungstic acid, Dragendorff's reagent, iodine in solution of iodide of potash, picric acid, tannic acid in neutral solution, potassio-iodide of cadmium. Colour reaction, green, with sulphuric acid with bichromate of potash crystals. Indefinite colour reactions with hydrochloric acid, nitric acid, and liquor ammoniæ. It gave no reaction of glucosides. It is not a volatile alkaloid; it cannot be obtained by distillation methods.

Viburnic acid is present in greater amount, and is easily separated by methods recommended for the extraction of valerianic acid. If redissolved and neutralized with soda, and again evaporated, stable crystals of the viburnate separated out, which have an odour similar to but not so strong as that of the acid.

The pure resin has the characteristic fracture, softens on heating, has very little taste or odour, is soluble in alcohol, alkalies, etc.

Physiological Experiments.

These I shall refer to shortly.

1. In a rabbit, 457 grammes weight, two drachms of the ordinary

fluid extract, given hypodermically, caused weakness, and sprawling, incoördinate motions. Later, inability of the legs to support the body. Head rested on table. Increased pulse and respiration-rate, drowsiness, slowness of reflex, and death.

2. If the fluid extract be exhausted of its alcohol by evaporation, the residue extracted with distilled water, and this be injected, a quantity equivalent to one drachm of the fluid extract has no effect. This extract was minus the alcohol, resin, and most of the alkaloid.

3. In this experiment the fluid extract, simply evaporated to a syrup, so as to get rid of the alcohol, was used. A quantity equivalent to nearly an ounce of the original extract was injected at intervals during two hours. The only effect obtained was some drowsiness.

4. An extract was made from the root-bark. The alcoholic extract was evaporated, and the residue treated with distilled water so as to make a 2·1 extract. There was very little result from injection.

5. 7½ grains (½ gramme) of the resin was rubbed up with water, and injected into the peritoneal cavity. No special morbid sign resulted. Recovery was complete.

6. The fluid extract was evaporated to one-third of the original volume, so that it was practically free from alcohol. Two drachms were injected into the peritoneum of a rabbit (576 grammes). This caused, after about half an hour, sprawling, somnolence, slight resistance when one attempted to put it on its side. Gasping inspiration, insensitiveness of pupils, death. Post-mortem—ventricles in diastole. (ʒij. = ʒvj. ext. fluid.)

7. The same experiment was repeated in a larger rabbit (1102 grammes). Here the equivalent of ℥j. of the extract fluid was injected intraperitoneally. The animal seemed disinclined to move about, and rested its abdomen on the table. There was, later, some drowsiness. Two hours afterwards the equivalent of ℥j. additional was injected. Following this there was a tendency to drag the hinder part of the body and to lie squat on the table. The reflexes were strong and the pupils normal. Next day had quite recovered; ate heartily. Abdomen quite lax; no peritonitis.

8. Aqueous extract of the bark, slowly evaporated to a syrupy consistence, so that ʒj. = 460 grains (30 grammes) of the bark. Injection caused some dragging of the hind legs and drowsiness. Recovered.

In these eight experiments on rabbits we do not obtain any absolutely incontrovertible data to go upon in determining the effects of Viburnum prunifolium. The only effect when the alcohol is eliminated is to cause drowsiness, dragging of the hind limbs, and some general motor weakness. Large quantities of the drug had to be administered.

Experiments on the Frog (Cold-blooded Animal).

9. Rana temporaria: ♏x. of same extract as used in Experiment 8 injected into lymph sac. Results, after half an hour, sluggishness of reflex, muscular weakness, drowsiness, coma, and death.

10. Frog: heart excised with venous sinuses. Placed in ʒj. normal salt solution for five minutes; beating, 21 per minute. On adding ♏vj. of same extract as last, in three parts, at intervals, the heart stops beating in thirty-five minutes.

11. Frogs: two hearts removed, as in last experiment. One kept as control in normal saline solution, the other as in last experiment. The control was still beating after 1½ hour; the other died in five minutes.

12. Heart of frog removed as before and fixed in Williams' apparatus. Defibrinated sheep's blood, mixed with equal volume of saline solution, perfused. Heart-beat 16 per half minute. To 25 c. c. blood was added 2 c. c. of extract = 4 grammes of the bark—neutralized. This was next perfused. Heart-beats slowed to 9 per half minute. Recovered to 15 per half minute on passing the pure blood. Stronger solutions were then passed, and it was found that the heart could be stopped in diastole; but if pure blood were passed recovery took place, though not to the normal rate of beat.

13. A solution giving alkaloidal reactions corresponding to 10 grammes of the bark, neutralized and injected. Died on the third day. Heart in diastole.

14. A solution consisting of the organic acid, after injection, caused some dulling of sensibility and drowsiness, with death on the third day.

15. Frog injected with ♏xij. of a 2·1 aqueous extract (made from an alcoholic extract with acidulated water, and neutralized). *2nd day.*—Reflexes slow, quiescent; requires strong irritation to make it jump. Tends to relapse into drowsy state. *3rd day.*—Dead.

16. Alkaloidal solution similar to that used in Experiment 13, but made in an improved manner. ♏x. injected = ʒxxx. of the bark. Forty-five minutes after, general dulling of sensibility. "Hardly moves, although pinch strongly. Is slow in returning to normal position if placed on its back. Four hours later, reflexes slow and weak. Cannot lift body from table. Incoördinate movements of fore limbs." Difficulty of movement gradually increased. Abdominal reflex was lost, still a slow reflex was present on irritating the skin of the thighs. Died.

17. Same solution used. Sciatic nerves exposed, and on the left side all other structures in the limb ligatured. A greater induced current was required to cause contraction in the unligatured limb than in the other.

In frogs, then, we get more marked effects,—Diminution or loss of reflex; lessening of motor power, both voluntary and involuntary muscle (heart).

There seems to be both in the rabbit and frog a central sedative action.

Blood-pressure experiments showed, in the rabbit, a rapid fall, followed by a slow return to normal, or nearly normal. During depression the primary curves of respiration were less marked, and the heart-beats showed irregularity. Both showed a certain return towards normal.

In the frog, the tracing showed marked effects. While the pure blood passed, the contraction curves were regular in time and volume. As the poisoned blood was substituted, the pulsations gradually became less powerful, and the intervals between them longer, until at last the ventricles stopped in diastole, the auricles occasionally continuing to pulsate for a few seconds.

Recovery took place if pure blood were passed through the heart, and the cycle may be repeated several times.

Effect on Man.

To see if I could demonstrate any effect by pulse tracings, I took ʒvj. of the ordinary fluid extract within thirty minutes, previously taking a tracing. Pulse-rate was slightly lowered, and tracings taken two hours after showed slight softening. To my tactile sense there was also a change in the pulse.

There was slight frontal fulness, not amounting to headache, with very slight discomfort. Other observers have noticed in patients, headaches, disturbances of vision, and dryness of the mouth after administration of this drug. This shows, markedly, the absence of toxicity of viburnum.

Conclusions.

In mammals, warm-blooded animals, owing to the difficulty of giving a large enough dose hypodermically, there is no marked effect, except drowsiness and some lessening of motor power. If the substance be introduced into the heart directly, there is rapid lowering of blood-pressure to about one-half the normal, with slow return to near the normal as the drug is eliminated.

Although too much reliance must not be placed on experimental results in cold-blooded animals as applicable to warm-blooded animals, including man, we may be allowed to take something from these results and use them as *probably* applicable.

Thus, there is *probably* some diminution of reflex irritability, a quieting effect on involuntary muscle, possibly some lowering of blood-pressure, which, even though small, might afford relief in congested conditions. Then, and very important, there is the effect of the valerianic or viburnic acid in neurotic and hysterical conditions.

In the Pharmacopœia there are many drugs capable of bringing about all these desired effects. Why, then, use Viburnum prunifolium? Opium is one of our sheet-anchors, but then there are dangers and inconveniences attending its use. The patient may acquire the opium habit; the constipation caused by it is very troublesome, and it is very toxic.

Viburnum has similar good effects, though not so strong. It is a good form in which to administer valerianic acid. Its effect upon unstriped muscle, though not so strong as that of opium, gives the relief necessary. It has scarcely any effect in causing constipation.

Toxic effects have only been noticed with very considerable doses. Herrick has seen disturbance of vision, dryness of mouth, headaches; and Wilson has observed similar conditions, but these are with doses larger than are usually administered to man.

Preparations.

1. Simple aqueous decoction,—not very pleasant.
2. Tincture, 1 in 5, or as in France 1·1.
3. Fluid extract, made according to the U.S. Dispensatory, with a mixture of alcohol and water. "Extract by percolation the root-bark of Viburnum prunifolium in No. 60 powder, 100 parts, with a mixture of alcohol (90 per cent.) 2, and water 1, by weight. Reserve the first 85, evaporate the remainder to a soft extract. Dissolve this in the reserved portion, and add enough menstruum to measure 100. Dose ʒss.–ʒij."
4. Inspissated extract. And I would recommend the following:—
5. Capsules. These are made by evaporating ʒj. of a 1·1 fluid extract to ♏x. at low temperature or in vacuo, and enclosing in a gelatine capsule. These are readily taken, as the taste and unpleasant smell are masked. If kept for a little time the gelatine becomes dimpled, by absorption of water from the extract by the inner surface of the capsule.

They were made for me by Mr D. Middleton, Edinburgh.

This research was carried out in the Laboratory of the Royal College of Physicians, Edinburgh.

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Dr Craig remarked that he would have liked to have heard the other Fellows of the Society state their experiences of viburnum prunifolium before giving his own opinion. He said the Society was much indebted to Dr Shennan for his paper. He (Dr Craig) had exhibited the drug to the Medico-Chirurgical Society in November 1883, and had for years previously lectured on the drug to his class. In his experience he had found it a valuable uterine sedative and a most powerful medicine for checking uterine hæmorrhage, and above all for preventing threatened abortion. He explained that when once a threatened abortion had proceeded a certain length, no medicine could stop it, but gave it as his opinion that if an abortion could be prevented by medicine, viburnum prunifolium would do it. He also explained that in the case of a dead fœtus it would not prevent abortion, nor was it desirable to do so. He regarded it as a most valuable drug, and one which should be extensively used.

Dr J. W. Ballantyne had found viburnum of special use in threatened abortions where hæmorrhage without marked dilatation of the cervix was the leading symptom. He thought it was best given inspissated and in the form of capsules.

Prof. Simpson agreed with Dr Craig in regarding the drug as distinctly efficacious in checking the symptoms of threatened abortion. It might be difficult in such cases always to say that to the administration of the viburnum the good result was due, but the results in his own experience had been such as to lead him to believe that it had a very marked effect in allaying uterine action. It was a very important service that Dr Shennan had rendered to obstetrics and gynæcology to investigate the constitution and mode of action of the drug, and the Society was to be congratulated on having a communication of this scientific value brought before it. No doubt Dr Shennan's paper would lead to more frequent employment of viburnum in practice, and probably at a later period it would be followed by further clinical observations.

Dr Haultain said that after a considerable experience in the use of the drug he had no hesitation in commending it as a uterine sedative,—an action which was fully justified by its effect in

quieting after-pains, and also the painful, irregular, and useless contractions occasionally met with in the first stage of labour. Its palliative effect in dysmenorrhœa was probably due to its quietening the contractions of the uterus, which was trying to overcome the obstruction to the menstrual flow, caused by spasm of the os internum or other conditions. That it tended to relieve the spasm was also consistent with this theory of its action. Its action was thus much like opium, without the analgesic effect of the latter. Its sedative effect in cases of threatened abortion was undoubted, but only where these were due simply to uterine contraction. If, however, much separation of the ovaries had already occurred, or if the embryo or its appendages were diseased, it was obviously useless. The capsules were undoubtedly the best manner of prescribing it, as its taste was intolerable to most.

Dr Macvie congratulated Dr Shennan on having done a valuable bit of work. He had noticed that Dr Shennan did not make a large claim on behalf of viburnum as a uterine sedative and anti-spasmodic, or as a cardiac depressant. That coincided with the clinical experience he had had of the drug. He could not regard it as at all equal to opium or potassium bromide. Some cases of miscarriage it did not seem to touch at all. In a case of recurrent miscarriage at the sixth month the fœtus was expelled as usual, although viburnum had been used for a month previous.

Dr Shennan replied.

VIII. A RARE FORM OF ABORTION—EXPULSION OF THE AMNIOTIC SAC ALONE.

By F. W. N. Haultain, M.D., F.R.C.P.E., Lecturer on Midwifery, Edinburgh School of Medicine.

In January 1891 I showed to this Society an abortion sac which had been expelled from a patient who believed herself to be about three months pregnant.

The sac was the size of a large orange, and was formed simply by the amnion; it was distended by liq. amnii, in which was a large quantity of detritus, but no trace of an embryo. I also showed the decidua, which was thick, and completely lined by the adherent chorion. Unfortunately, through the burning of my museum, I am unable to again show this specimen.

Since that time, however, two more examples of simple expulsion of the unruptured amniotic sac have come under my notice, both of which I am able to show. In these it will be noted the embryos are well formed, appearing to correspond to a period of development of about eight weeks. In one of them it will further be noted that the amount of liquor amnii is far in excess of what is generally present with embryos of that age. In this case the clinical history is sufficiently interesting and instructive to merit detailed description.

The patient, aged 37, iii.-para, believing herself to be about three and a half months pregnant—calculating from her last menstrual period—expelled per vaginam, after a few hours of abdominal pain and slight hæmorrhage, a large cyst about the size of a goose egg.

As she lived several miles from her medical attendant, Dr Stirling of Perth, it was some hours after its expulsion before he could attend. On arrival he found, as is usual, that all clots, etc., had been scrupulously removed, and the cyst alone remained to explain the nature of the case.

There being now but trifling hæmorrhage, and an entire cessation of uterine contractions, he naturally inferred that expulsion of the ovum had been complete, an inference that was strongly corroborated by the os uteri being but slightly dilated.

The progress of the case was for the first two weeks eminently satisfactory; all hæmorrhage ceased within twenty-four hours, and the only symptom which otherwise marred a complete recovery was an excessive watery vaginal discharge. This continued steadily to flow in spite of treatment by means of hot vaginal syringing and douching, and after the third week was from time to time associated with considerable blood loss.

The patient from this cause gradually became so enfeebled that I was asked by Dr Stirling to see her, six weeks after the abortion had occurred. On examination, I found the uterus considerably enlarged, and the os uteri slightly dilated, but insufficiently to admit the introduction of a finger.

After dilating with Hegar's dilators, I felt the uterine cavity to be lined with a rough irregular mass, which I recognised as the decidua. This I had considerable difficulty in removing, as from its intimate connexion with the uterine wall it had to be torn off piecemeal. The operation was attended by free, almost alarming hæmorrhage.

On examination of the pieces of tissue removed, many portions of chorionic membrane could be seen adherent to the decidual tissue, while by the microscope vascularized chorionic villi were seen in great abundance.

Unfortunately, the clinical history of the second specimen shown cannot be got.

The pathological, clinical, and even physiological considerations of the specimens cited and quoted are of considerable interest, and I trust have warranted me in bringing them under your notice. From their pathological aspect the preparations are interesting from their rarity, or, perhaps, I should rather say from the want of description of similar specimens in the many popular midwifery text-books. That they are rare is probable, but it is a strange coincidence that since my attention has been directed to this condition, I have in a comparatively short space of time met with three well-marked examples. Yet, after an exhaustive search

through the eminent works of Lusk, Playfair, and Parvin, I have been unable to find a single reference to the occurrence of this form of abortion. That this is due to their want of importance can be no plea for the omission, as I shall endeavour to show, when considering their pathological and physiological bearings.

In the *American System of Gynæcology and Obstetrics* mention is made of the existence of this form of abortion, and a woodcut of the condition is represented, while a fuller description, illustrated by two drawings, is met with in Winckel's *Text-book of Midwifery* (p. 297).

What the exact cause of this form of abortion is, must, from the scant material at disposal, be more or less speculative as to whether it be the result of a simple accident, or occasioned by pre-existing ovular disease.

To the former Winckel seems to lean, attributing it to a simple tearing of the amnion from the chorion during expulsion. He at the same time depicts two examples at the fourth and fifth month respectively, and avers that the cord had been torn at its placental insertion.

That rupture of a healthy cord at this situation without laceration of the amnion can occur so late in pregnancy as the result of simple uterine contraction is difficult to imagine, if one tests the strength of normal cords at this period of development.

More probable is it, that pre-existing disease and death of the embryo has been present, rendering its attachment to the uterus less secure. This supposition is strongly supported by the specimens which have come under my notice. In the first, this is undoubted, there being no trace of embryo present; while in the second, it will be seen that there is, firstly, an excess of liquor amnii, in which is present a large quantity of debris ; and, secondly, an extremely feeble cord for the size of the embryo, while its placental end is represented by a thickened, smooth nodule, no trace of tearing being present. In specimen 3 the embryo lies free in the amniotic sac unattached to the amnion. This may, however, be due to subsequent tearing of the cord, but careful examination fails to reveal any portion of cord either attached to the amnion or embryo.

The total absorption of the embryo in Case I., and the large quantity of detritus in the sac of specimen 2, naturally point to the death of the embryo some considerable period before expulsion of the sac occurred, while the large excess of liquor amnii in both cases suggests its continued secretion after the embryo had ceased to live, a condition which has already been stated to be possible by other writers. It may, however, be argued that early hydramnion has been the cause of death of the embryo,—a contention it is absolutely impossible satisfactorily to refute from the evidence of the two cases.

In this relation the physiological bearings of the preparations in

regard to the origin of the liquor amnii must be evident. To go deeply into this intricate and much disputed question is naturally quite outside the scope of this paper, but one cannot help noting that the maternal origin is strongly supported, firstly, by the excess of liquor amnii when compared with the development of the embryos, which give every evidence of having died a considerable time before expulsion; and, secondly, from the extremely interesting history of Case II., in which the profuse watery discharge formed such a prominent symptom, the discharge being derived from the thick vascular decidua. From what has been shown it may be inferred that the pathology of the condition, so far as can be elicited from the specimens before us, goes to show that there has been primary death of the embryo, which has given rise to uterine irritation and contraction, resulting in the expulsion of the amniotic sac through tearing of the chorion, which has been retained through its intimate attachment, by means of its villi, to the still adherent vascular decidua.

This mechanism of expulsion being necessarily associated with the least possible interference with the attachment of the decidua to the uterine wall, must lead to the formation of the so-called cavernous mole by allowing of continued growth of the still adherent decidua, and throws light upon the absence of the fœtus, which is so commonly met with in these specimens, and which is usually assigned to its complete absorption.

Clinically this form of miscarriage is instructive, as showing how abortion may occur with a minimum of hæmorrhage and decidual detachment, and allow, therefore, of combined decidual vitality for a prolonged period, which will not from its presence stimulate uterine contraction, and thus court expulsion. At the same time, the record of watery vaginal discharge as evidenced in Case II., may, though rare, be the means of assisting diagnosis under similar conditions. Indeed, from the many interesting aspects presented, I trust I have been justified in bringing the subject shortly before you, and thus putting on record the cases of this somewhat unusual form of abortion.

Dr J. W. Ballantyne had met with some instances of the same anomalous forms of abortion as Dr Haultain had described, and one or two of them he had shown to the Society. He was not prepared to believe that the absence of the embryo from the abortion-sac was always due to absorption or dissolution in the liquor amnii, for he thought that the researches of Giacomini and others had shown that the blastodermic vesicle might develop without the embryo appearing at all in the germinal area. He had often pointed out the value and interest of the examination of all cases of early abortion; unfortunately many of these specimens did not fall into the hands of observers so accurate as Dr Haultain.

Dr Haig Ferguson had listened with much interest to Dr Haul-

tain's paper. He had met with at least one similar case of expulsion of the entire amniotic sac in an abortion, the chorion and decidua being left *in utero*. He desired to call attention to the same thing happening in a full-time labour. For example, just last week, in an otherwise normal labour, Dr Ferguson had expressed the placenta in the usual way, and found that only the amnion was attached to the placental margin, while the chorion and decidual remains were absent. The amniotic membrane was perfectly complete, with an almost central rupture. In consequence of this deficiency of the membranes he passed two fingers through the cervix and removed with comparative ease a very considerable mass of membranes. He mentioned this case in connexion with Dr Haultain's paper, to impress the importance of a very careful examination of the membranes (in addition to the placenta) after every labour, in view of the possibility of a contingency such as he had described. There was no sign of disease about the placenta or membranes in this case.

Prof. Simpson said he was in the habit of teaching his students to note that the different products in cases of abortion varied according as—1, the uterus cast its entire contents. In that case the external covering consisted of decidua vera with the placental or serotinous area all complete. 2. There might be the ovum and its decidual wrappings complete, with the exception of the placenta or a portion of it. 3. The vera might be left, while the ovum escaped encapsuled with the reflexa and carrying with it the serotina. 4. There might be reflexa and its contents, with fragments only of the serotina. 5. The reflexa also may have burst and the ovum alone be extruded, presenting on its outer aspect the shaggy surface of the chorion. 6. In other cases the chorion as well as the uterine membranes has been torn and left attached to the uterus, so that only the amnion with its contained liquor amnii and embryo was discharged. It was to this variety that Dr Haultain's interesting cases belonged.

Dr Haultain thanked the Society for their discussion on his paper, and remarked that his object in introducing the subject was principally to bring before the Fellows of the Society the fact that such a variety of abortion occasionally occurred, as he took the liberty of presuming that such might not be known to some,—the scant if not entire absence of description of the condition in most of the popular books on midwifery having at least allowed him to be ignorant of the condition, till his attention was drawn to it by the actual specimen.

MEETING III.—JANUARY 8, 1896.

Dr BERRY HART *in the Chair.*

I. O. H. Isard, M.B. C.M., Docharn, Elmbourne Road, Upper Tooting, was elected an Ordinary Fellow of the Society.

II. *Dr N. T. Brewis* showed—(*a.*) Four PAPILLARY TUMOURS OF THE OVARY; (*b.*) two PUS-TUBES removed from a young woman aged 20; (*c.*) two INTRA-LIGAMENTARY OVARIAN TUMOURS removed from a patient aged 60; (*d.*) UTERINE APPENDAGES removed from a patient with myoma of the uterus.

(*e.*) OVARIAN TUMOUR removed by abdominal section after complete detachment of the pedicle. Mrs G., æt. 40 years, patient of Dr Fleming, Kelso, was admitted to Cambridge Street Home for Women on November 4, 1895, complaining of an abdominal swelling. Married twenty years; one child nineteen years ago; no miscarriages.

History.—About two months previous to admission patient noticed that her abdomen had become swollen. The swelling continued to increase, and about six weeks later she began to suffer from occasional dragging pains in the lower part of the abdomen, worse on the right side, and pains going down the left leg. She then consulted Dr Fleming, who told her an operation was advisable. Before admission the pain had almost entirely ceased. There had been greatly increased frequency of micturition since the swelling was noticed. The swelling had not inconvenienced her in any other way, and she had been able to perform her household duties as usual.

Menstruation regular, twenty-eight day type, lasting about a week, ordinary amount, slight pain during several days before and first two days of flow; not modified in any way by presence of swelling, except an increase of pain at periods. Never any intermenstrual discharge. Micturition much increased in frequency for last two months. Bowels very regular. Previous health and family health good.

Physical Examination (made Nov. 6).—On inspection the abdomen was seen to be occupied in a nearly uniform manner by a swelling. The contour was rounded, bulging being most distinctly prominent about 2 inches below the umbilicus and in the flanks. Umbilicus slightly retracted. On palpation a distinct large mass was felt occupying the whole abdomen, except right hypochondriac region. This was fairly movable. Fluctuation was well marked in portions of the tumour. The mass was of fluid consistence, and had a smooth surface; fluid thrill was not easily made out. On percussion a dull note was got over the rounded area about and below the umbilicus. A resonant note was got in the flanks, and a zone of resonance was found to extend round the

lower limit of the swelling continuous with the note from the flanks. On auscultation nothing was heard except a few intestinal gurglings.

Mensuration.—Girth at umbilicus, 35 inches; girth 2 inches below umbilicus, 36 inches; umbilicus to pubes, 7 inches; umbilicus to right ant. sup. il. spine, 7½ inches; umbilicus to left ant. sup. il. spine, 7½ inches.

On bimanual examination the uterus was felt to the right side and to the back. No part of the tumour was felt in the pelvis, and traction made upwards upon the tumour rendered neither fornix tense.

Progress and Treatment.—From her admission on November 4 until November 14 the patient was exceedingly well. She was free from pain, and her general condition became much improved.

On the 13th her bowels did not move at all, and only slightly on the 14th. On the 14th her abdomen felt very hard, and after she had gone to bed in the evening she complained of a severe pain "in her bowels." Castor-oil was administered, and it was repeated next morning, and an enema given, which procured a free motion. During the whole of the next day she was fairly well and free from pain. On the morning of the 16th the bowels again moved freely, but later in the forenoon she again complained of abdominal pain, and vomited. She continued to complain of pain all day, and in the evening the temperature rose to 100° F. On the morning of the 17th she again had castor-oil and was fairly well all day, although complaining of some pain. The pain in the evening became so severe that two ¼-grain morph. suppositories were given, after which she had a good night. Next morning (the 18th) she was seized with severe abdominal pain and vomiting. The abdomen was generally distended, hard, and very tender, and a peritonitic rub was distinctly heard all over the abdomen. There was also a well-marked pleuritic rub. The pain was all through the attack most severe low down in the right side. The temperature remained about 100° and 101°, and the pulse about 120-130. Poultices were constantly applied. On the evening of the 19th flatus was passed, and later on the bowels moved copiously. The distension began to diminish, and the abdomen became softer. She continued to improve steadily until the beginning of December, when she was considered strong enough for operation.

On December 3 abdominal section was performed. Previous to rupture the tumour was freely movable. At the time of operation it had increased in size and was immovable. The intestines were found closely matted to one another and to the entire surface of the tumour. The adhesions, however, were not strong, and the bowels were separated from the tumour without difficulty. No distinct pedicle was recognised, though a band of tissue resembling one was found attached by delicate adhesions to the right lower surface of the tumour. On aspirating the latter it was found to

contain dark venous-like blood. The bowels were, as before stated, adherent one to another. Their peritoneal coat was very dark in colour, and blood oozed from its surface. No ligaturing was required, the tumour being simply shelled out from amidst the surrounding bowels. The abdomen was irrigated and drained, and the patient recovered without a bad symptom.

When removed, the tumour presented a dark reddish-brown appearance, slightly green in places. The tube was found lying along the outer surface of the tumour for about 4 inches, its inner end being broken off at the raw surface representing the site of the pedicle attachment. The tumour was found to be unilocular, and, as before mentioned, was filled with dark blood. The wall of the cyst for a considerable area at the site of the pedicle is greatly thickened and infiltrated with dark venous blood. The remainder of the cyst wall is somewhat thin.

III. *Dr Kynoch* showed specimen of ARRESTED DEVELOPMENT OF AN EMBRYO. The woman from whom it was got was 28, and had three full-time healthy children. In April 1893 she had a miscarriage about the third month, followed by pelvic cellulitis. In October 1894 she had another miscarriage at the sixth month. She was then perfectly regular every month till the end of June 1895, her last period ceasing on the 30th. This was followed by nine weeks' amenorrhœa, and she aborted on the 31st of August, but she had slight hæmorrhage for ten days before this date. The gestation sac when fresh was about the size of a small hen's egg, covered by the decidual membranes. There were recent hæmorrhages at both ends of the sac. On opening the sac a small quantity (probably a teaspoonful) of viscid fluid escaped, and lying close to the inner surface was found an embryo measuring 3·5 mms. in length, and corresponding in size to an embryo examined by Prof. Winckel, and supposed by him to be fourteen days old.

IV. *Dr C. Martin*, Birmingham, showed FIVE UTERI REMOVED BY PAN-HYSTERECTOMY. (See Cases III., IV., V., VI., and VII. in Dr Martin's paper, pp. 63, 64.)

V. *Dr J. W. Ballantyne* showed—(*a.*) A small INIENCEPHALIC FEMALE FŒTUS, which Dr Geo. H. Pirie (Dundee) had kindly sent him. The following were the clinical notes of the case:—The mother, aged 42 years, a x.-para, had been married twenty years. She had had eight confinements at the full term, and all these ended in the birth of living infants; but of these three have since died,—one from bronchitis, another from whooping-cough, and the third, at the age of 5 years, from a "trouble in his head," which was accompanied by starting and screaming at night and by great wasting. The other five children are strong and healthy. She had one miscarriage at the fourth month about five years ago. It is stated that the fœtus was perfectly formed. In the present

pregnancy (the tenth) nothing worthy of note occurred save the absence of movements, till at the seventh month suddenly the whole ovum came away entire (Dec. 17, 1895). She had last menstruated in the middle of May, and had had no accident or shock. On cutting into the amniotic sac about a pint of liquor amnii of a pea soup consistence and colour was found, and in this was the small fœtus attached by a cord 18 inches long. The placenta and membranes seemed to be normal. The mother has made a good recovery, and both she and her husband have always enjoyed good health. The fœtus was typically iniencephalic, but was considerably macerated, and must have been dead *in utero* for two months or so. There was retroflexion of the spine and a collapsed spina bifida.

(*b.*) A PLACENTA showing the persistent UMBILICAL VESICLE. It lay in close proximity to the insertion of the cord, which was markedly eccentric, and a distinct fold of the amnion ran directly from the cord to the vesicle. This fold has been often referred to. The fœtus was prematurely born about the seventh month, and the mother was albuminuric.

VI. *Dr R. C. Buist*, Dundee, showed a FŒTUS COMPRESSUS.

VII. ON PAN-HYSTERECTOMY, OR TOTAL EXTIRPATION OF THE UTERUS.

By CHRISTOPHER MARTIN, M.B., F.R.C.S. Eng., Surgeon to the Birmingham and Midland Hospital for Women.

THE term hysterectomy is somewhat loosely employed to denote any operation which involves partial or complete removal of the uterus. This removal may be made per vaginam (vaginal hysterectomy), or by abdominal section (abdominal hysterectomy). In partial hysterectomy the uterus is removed at or about the level of the internal os—the cervix being left as a "stump." This stump may be treated by the extra-peritoneal method (the clamp operation) or by the intra-peritoneal method, where the stump is sutured and dropped back into the abdomen.

To-night I propose to direct your attention to complete hysterectomy by abdominal section, total extirpation of the whole organ, *including the cervix*, or pan-hysterectomy.

Freund introduced the operation of total abdominal hysterectomy for cancer, but the mortality was so terrible that the method soon became discredited, and finally abandoned.

Bardenheuer was the first to perform pan-hysterectomy for myoma, and records seven cases with six recoveries. Martin of Berlin has adopted this method, and recommends it with all the weight of his great authority. In America, Baldy, Polk, Krug, Boldt, and others have recorded series of successful cases.

In this country we have been more conservative, and have

only adopted the operation in very recent years. We owe its introduction to Jessett of London, and Smyly of Dublin. Jessett did his first case in February 1892, and Smyly followed in the autumn of the same year.

I had the privilege of watching Dr Smyly perform the operation in 1894, and I take this opportunity of expressing my very deep indebtedness to his teaching. During the year 1895 I performed the operation eight times—six times for myoma, once for perforation of the pregnant uterus, and once in a case of occluded cervix with hæmatometra and pyosalpinx. All my cases have recovered. Before, however, I refer to these cases, let me give a general description of the technique I have adopted.

The patient is prepared as for an ordinary abdominal section. The pubes is shaved, the vagina, vulva, and abdominal wall are scrubbed with soap, washed with lysol solution 1 per cent., and finally with corrosive sublimate 1 in 1000. The vagina is packed with antiseptic gauze, and an antiseptic compress is applied to the abdomen.

The instruments, the silk ligatures, and the silkworm gut sutures, the gauze pads (used instead of sponges), and the water to be used at the operation, are all sterilised by boiling. I try to render aseptic my own hands and those of my assistant and nurses by prolonged scrubbing with soap and lysol, followed by immersion in corrosive sublimate. The patient is anæsthetised, and the gauze removed from the vagina. The patient must be kept as warm as possible on the table, and by hot-water bottles and blankets. I prefer to operate standing on the patient's right side, as for ovariotomy, with the patient lying in the ordinary dorsal position.

The abdomen is opened in the usual way, and the incision is made long enough to permit of the easy delivery of the tumour. When this has been effected, large gauze pads are to be packed into the abdomen above and behind the tumour, to soak up blood, etc., and to prevent undue exposure of the intestines. Sometimes the tumour cannot be delivered through the wound until one or both broad ligaments have been ligatured and partially divided.

The surgeon should now rapidly note the relation of the tumour to the uterus. He should determine the position of the cervix, and the line of reflexion of the peritoneum from the uterus on to the bladder. He should note the position of the ovarian and uterine arteries, and of the venous sinuses of the broad ligament. In some cases he is able to palpate the ureters as they course from the brim of the pelvis towards the bladder. In this investigation, and throughout the whole of the rest of the operation, a good light is essential, and I have found the electric hand lamp of the greatest value.

If you look at Diagram No. 1, you will see that the uterus receives on each side a double arterial supply—the ovarian artery running in the upper third of the broad ligament just beneath the Fallopian tube, and the uterine artery running in the lower third

just above the vaginal reflexion. The ovarian and uterine arteries on each side unite in a large anastomotic loop, which runs in the broad ligament close to the lateral border of the uterus. The vessels of one side of the uterus anastomose with those of the other side just beneath the peritoneum. Lastly, a few arterial twigs run upwards from the vaginal arteries into the cervix. The veins in each broad ligament form a plexus (often composed of huge varicose sinuses) which empties in two directions—into the ovarian plexus, and into the utero-vaginal plexus. I have not indicated these veins in the diagrams, but in many cases they are much more formidable, from the surgeon's point of view, than the arteries.

The broad ligaments must now be ligatured in sections and divided (between *double* ligatures) as far down as the level of the internal os. For this purpose I employ Galabin's pedicle needle—a blunt fully-curved handled needle with two large eyes—and sterilised silk (No. 5). Selecting a spot in the broad ligament free from veins, about the junction of the upper and middle thirds of the ligament, and midway between the uterus and the pelvic wall, a double ligature is passed. Care must be taken that the two ligatures do *not* interlock. By pulling the one forcibly inwards and the other outwards the aperture of puncture is stretched or torn into a transverse slit, about one inch in length (see Diagram No. 1, left side). In some cases I have made this transverse slit by forcing a pair of blunt forceps through the aperture of puncture, and then widely opening them. If this slit be not made, it is difficult to tie the ligatures in such a way that sufficient tissue is left beyond the ligatures to prevent slipping. The two ligatures are tied as far apart from each other as possible, and the intervening strip of broad ligament severed with a snip of the scissors. Whenever possible, I prefer to remove the ovaries and tubes with the uterus, and hence the outer or proximal ligature should be tied outside the ovary and Fallopian tube. This, however, is not a matter of great importance. On the right side of Diagram No. 1 is shown the condition of parts at this stage. In place of the distal ligatures —those on the uterine side—forceps may be applied. I prefer the ligatures, however, as they are not so likely to slip, and they do not by their presence hamper the surgeon. The same manœuvre is to be repeated on the other side. We have now tied both ovarian arteries, and divided the upper third of both broad ligaments.

The middle third of the ligament must be similarly treated. A double ligature is passed through the broad ligament about the level of the internal os, and nearer to the uterus than the first ligature. The aperture of puncture is stretched into a transverse slit, the two ligatures tied as far apart as possible, and the intervening bar of tissue divided. The same manœuvre is repeated on the other side.

The next step is to detach the bladder from the anterior

surface of the uterus. The line of reflexion of peritoneum from the uterus to the bladder can usually be seen as a whitish line, above which the peritoneum is firmly attached, and below which it is loosely attached, to the subjacent tissue. In case of doubt a sound should be passed into the bladder, and the limits of the viscus determined. A curved incision is now made about two-thirds of an inch above the line of reflexion across the anterior surface of the uterus from one broad ligament to the other. This incision should not penetrate deeper than the subserous connective tissue. The bladder can now be easily stripped off the uterus as far as the vagina by peeling it downwards with the thumb. The surgeon can tell when he has reached the vagina by introducing a stout pair of Spencer Wells' forceps into the vagina, and feeling for them with his finger in the gap between the uterus and the bladder. The vagina should now be opened close to the anterior lip of the cervix, by cutting with scissors on to these forceps, and the opening thus made enlarged by tearing. Hooking the forefinger through this opening into the vagina, and using it as a guide, the posterior fornix is similarly opened with scissors.

The uterus is now attached on each side solely by the lower third of the broad ligament containing the large uterine artery (see Diagram No. 2). Should the ureters be seen, they should be carefully pressed outwards. The surgeon must now ligature the uterine artery, and this is one of the most difficult steps of the operation, particularly if the tumour be a large one, more or less filling the pelvis. He must take care, firstly, to pass the needle on the uterine side of the ureter, otherwise this duct would be tied with fatal results; secondly, he must leave enough tissue beyond the grasp of the ligature to prevent it slipping. With his left forefinger passed into the vagina from behind, he guides the pedicle needle under the uterine artery close above the mucous membrane of the lateral fornix. There is not room to tie a double ligature and to cut between. These ligatures should be tied on both sides before the uterus is cut away from either. The uterus should now be severed from the remaining attachments, keeping as far as possible away from the two lower ligatures. When this has been done, the uterus with its myomatous outgrowth is entirely free, and may be lifted out of the pelvis.

The cut edges of the vaginal wall should be seized with forceps, drawn slightly upwards, and inspected. Should there be any bleeding points, a few fine silk sutures should be passed to control the hæmorrhage. I have never had any trouble from this source. The pelvis should be sponged clear of clot, and the pedicles and all raw surfaces carefully inspected with the aid of the electric light, any bleeding points being seized and ligatured. All the ligatures, except those controlling the uterine arteries, are to be cut short and the pedicles dropped (see Diagram No. 3). A pair of Spencer Wells' long forceps

are passed into the vagina from below, and the two ligatures controlling the uterine artery drawn into the vagina. A thick roll of iodoform gauze must now be drawn down through the vagina by means of the forceps, until only about one inch of the gauze remains in the peritoneal cavity just above the vaginal opening (see Diagram No. 4). The bladder and divided broad ligaments fall together over the gauze, but I make no attempt to suture the peritoneum over the gauze, or to otherwise close the vaginal canal. The abdominal wound is now closed by interrupted silkworm gut sutures, no drainage-tube being inserted unless there have been extensive adhesions and there is oozing. The iodoform gauze, which fills the vaginal canal from the peritoneum to the vulva, acts as a drain, and forms an efficient barrier between the peritoneum and infection from below. Its upper end quickly becomes encapsuled with aseptic lymph, so that, when it is removed on the fifth or sixth day, there is left just above the vagina, and opening into it, a granulating cavity shut off from the general peritoneal cavity, and containing on its lateral aspects the stumps of the uterine arteries.

The method I have just described has at least one recommendation, its comparative simplicity. I may point out that I do *not* use the Trendelenburg posture, as Jessett and the Americans do, nor do I operate sitting between the thighs, as Martin of Berlin and Smyly do. I do not make anterior and posterior flaps, as Jessett does. I make no attempt to suture the peritoneum over the open vaginal canal, trusting entirely to the iodoform gauze. I do not use the elastic tourniquet, and I use no special instruments beyond Galabin's needle and the electric lamp.

The after-treatment is similar to that after ovariotomy. For the first four days the catheter is passed every six hours. The iodoform gauze should be removed on the fifth or sixth day, and after this the vagina should be very gently syringed night and morning with warm weak iodine water. The stitches in the abdominal wall are removed about the ninth day, and the patient is usually able to get up during the third week, and to go home during the fourth week after the operation. The ligatures on the uterine arteries, which were left hanging into the vagina, are allowed to separate naturally. This they usually do during the second or third week. The patient generally makes as easy and uneventful a recovery as if she had undergone an ordinary uncomplicated ovariotomy. Although the operation is a long and tedious one, it is attended with but little shock, provided the patient be kept warm and the intestines not unduly exposed, handled, or chilled during the operation.

Let me now, in fairness, point out some of the difficulties and dangers of pan-hysterectomy, and some of the objections that have been raised to it:—

(1.) It is a long, difficult, and tedious operation, usually taking over an hour.

(2.) There is the danger of chilling the patient, unduly exposing the intestines, and so adding to the shock.

(3.) There is the danger of one of the ligatures slipping, with consequent internal hæmorrhage.

(4.) There is the danger of tearing the bladder and cutting or tying the ureters.

(5.) There is the danger of adhesion of bowel to some of the raw surfaces left in the pelvis,—a danger I believe to be greatly exaggerated.

(6.) There is the danger of infection of the peritoneum through the open vagina.

(7.) There is the danger of weakening of the pelvic roof by the removal of the cervix, and subsequent prolapse—a purely theoretical objection. It does not occur.

I have already indicated how most of these dangers may be avoided.

Let me now compare pan-hysterectomy for myoma with some of the rival operations.

(1.) Removal of the uterine appendages is a comparatively safe operation for small myomata (less, say, than a five months' pregnancy), but I have found it a risky and unsatisfactory operation in cases of large myomata. I have removed the appendages twenty times for small myomata with one death, and eight times for large myomata with two deaths. In about 90 per cent. of those who recover a cure results,—menstruation ceases, and the tumour shrinks. But in the remaining 10 per cent. the patient is *not* cured, the floodings continue, the tumour grows, presses on bladder and rectum, and renders the patient's life a burden to her. It is these failures that shake one's faith in the advisability of removing the appendages for myoma, and lead one to search for some more excellent way. I think that small myomata should be treated by vaginal hysterectomy, and large myomata by abdominal pan-hysterectomy.

(2.) For the treatment of large myomata, hysterectomy with extra-peritoneal treatment of the pedicle (clamp cases) is the favourite operation with most surgeons. To this method there are numerous and obvious objections. It is very risky, being attended by a mortality of 15 to 30 per cent. The patients that do not die escape by the skin of their teeth. They have an offensive necrosing stump, sometimes as thick as the wrist, filling the lower portion of the wound and slowly sloughing off. They run the gauntlet of septicæmia, peritonitis, and secondary hæmorrhage. When the stump separates, a huge suppurating chasm is often left going down to the peritoneum, and separated only by a weak barrier of granulation tissue from coils of intestine. The wound is slow in healing, and it is usually from four to eight weeks before the

patient may even sit up in bed. There is a great danger after these clamp cases of a ventral hernia forming at the lower end of the wound. In cases where the myoma invades the broad ligament or the cervix it is often almost impossible to get a safe pedicle when the clamp is used. In all these points pan-hysterectomy is superior to the clamp operation. It cures the patient, it is much less risky, the abdominal wound heals by first intention, the patient is up within three weeks, and there is but little risk of subsequent hernia. For my own part, I have vowed never to use a clamp again.

(3.) Hysterectomy with intra-peritoneal treatment of the pedicle and abdominal myomectomy seem to be attended with such great risks (internal hæmorrhage, suppuration of the stump, peritonitis, and septicæmia) that they are more dangerous even than the clamp operation, whilst they offer no advantages that are not better secured by pan-hysterectomy.

(4.) Vaginal hysterectomy for small myomata compares favourably, as regards mortality, even with removal of the appendages, whilst, of course, it offers an absolute cure. It is not advisable, however, in cases where the tumour is larger than a four months' pregnancy.

(5.) Enucleation per vaginam is usually a risky operation, except for small submucous tumours to which access is easy. It is justifiable in cases of large sloughing submucous myomata. In other cases, however, pan-hysterectomy seems to me to be a sounder and safer operation.

To briefly sum up the advantages of pan-hysterectomy: (1.) It absolutely cures the patient. (2.) It has a lower mortality than the clamp operation, than enucleation, and than the intra-peritoneal method of treating the pedicle. (3.) It is attended by but little shock. (4.) The convalescence is easy and uneventful, the wound heals by first intention, and the patient is up in about three weeks. (5.) There is a very slight risk of the subsequent formation of a ventral hernia.

Permit me now to briefly describe the eight cases in which I have performed abdominal pan-hysterectomy.

CASE I.—R. G., single, æt. 33, a patient of Dr Pitt's, of Oldbury, came to me suffering from a small myoma of the fundus, enlarged cystic ovaries, and hydrosalpinx. She was a very tubercular subject, lame from old hip-joint disease. She suffered from intense dysmenorrhœa. In February 1893 I removed the uterine appendages without any benefit. In April 1894 I dilated the cervix. As menstruation continued and her sufferings were extreme, I performed pan-hysterectomy, assisted by my brother Mr Charles Martin, at my private hospital on May 21, 1895. I found the uterus desperately adherent to intestine, and the stumps of both Fallopian tubes were distended with bloody fluid. She was some-

what collapsed after the operation, but rallied well. She was able to get up on the seventeenth day, and to return home on the twenty-seventh day. I saw her about a month ago, and as far as her pelvic symptoms were concerned she was quite cured.

CASE II.—M. A. B., married, æt. 53, was sent to me by Dr Lynch of Walsall. She had a history of severe and almost continuous floodings of eighteen months' duration. Two years before, she noticed a swelling in the abdomen, which had since rapidly grown. She was admitted into my private hospital, and on July 15, 1895, assisted by Mr J. F. Jordan, I performed pan-hysterectomy for a myoma which reached above the umbilicus. The tumour weighed 7 lbs. The ovaries and tubes were not removed. The patient made an excellent recovery. She got up upon the seventeenth day, and returned home on the twenty-eighth day, and has since remained well.

CASE III.—E. G., married, æt. 20, was about three months pregnant. On October 8, 1895, she began to abort, and on the morning of October 9 Dr Wilson of Balsall Heath removed a large mass of "hydatid mole" from the vagina. During the afternoon she became collapsed, having all the symptoms of grave intra-peritoneal hæmorrhage. Dr Wilson then sent for me. I diagnosed infiltration of the uterine sinuses, with myxomatous chorionic villi, perforation of the peritoneal coat of the uterus, and internal hæmorrhage. She was collapsed and nearly pulseless. As speedily as possible I opened her abdomen, assisted by Mr Charles Martin, and performed pan-hysterectomy. The abdomen was full of blood. On the anterior surface of the body of the uterus was a ragged perforation, through which tufts of chorionic vesicles were projecting into the peritoneal cavity. I did not remove the appendages. Her convalescence was delayed by an attack of phlegmasia alba dolens, but otherwise she made a good, if slow recovery. She was in bed nearly five weeks. I saw her the other day, and she was still anæmic, although otherwise in excellent health.

CASE IV.—H. W., widow, æt. 50, was sent to me in November 1893 by Dr Davidson of Coventry. She had then profuse menorrhagia of ten years' duration, and a large soft myoma, filling the abdomen, of six years' duration. I put her on ergot and hydrastis, and advised her to wait for the menopause. She ceased to menstruate in December 1894, but the tumour continued to grow and to cause serious pressure symptoms. The lower half of the tumour also became markedly cystic. I admitted her into the Hospital for Women, Birmingham, and on October 12, 1895, assisted by Dr Edge, I performed pan-hysterectomy. Both broad ligaments were terribly vascular, and six ligatures were required on each side. The tumour weighed 15½ lbs., and was a cystic myoma. She got

up on the twenty-fifth day, and returned home on the thirty-fourth day after the operation. I saw her the other day, and she was then in good health. Both ovaries and tubes were removed with the tumour.

CASE V.—F. H., single, æt. 34, was sent to me by Dr Hallwright suffering from a rapidly growing submucous myoma, retention of urine (requiring catheterisation), and menorrhagia. In July 1894 I opened the abdomen and removed her appendages. For a few months menstruation ceased, and the pressure symptoms diminished. They then recurred, and gradually increased in severity. The floodings became alarming, and on several occasions I thought she would bleed to death. Ergot and hydrastis were found to be useless. I admitted her into my private hospital, and on November 5, 1895, assisted by Mr J. W. Taylor, I performed pan-hysterectomy. I found no trace of the appendages. The tumour (which weighed 4½ lbs. after removal) so filled the pelvis that it was very difficult to reach the uterine arteries and to tie them without including the ureters. The bladder was spread out over the front of the tumour, and reached nearly to the umbilicus. She got up on the twenty-first day, and returned home on the twenty-fourth day, having made an uninterrupted recovery. She is now regaining strength rapidly.

CASE VI.—A. S., married, æt. 34, was sent to me by Dr M'Naught of Birmingham in September 1895. She had complete retention of urine, profuse menstruation, and a cystic tumour (which I diagnosed as ovarian) behind the cervix and filling the pelvis. I admitted her into the Hospital for Women, and on November 14, assisted by Dr Morgan, I opened her abdomen. The cystic tumour I found to be a globular enlargement of the fundus about the size of a five months' pregnancy, which, indeed, it very closely resembled. I incised it, and found it to be a cystic myoma, and I then proceeded to perform pan-hysterectomy, removing both appendages with the uterus. She made an absolutely uneventful recovery. She got up on the fifteenth day, and returned home on the twenty-second day, and has since remained well.

CASE VII.—E. G., married, æt. 26, was sent to me by Dr Cox of Winchcombe, with a history of severe floodings of five years' duration. She had for two years noticed a swelling in the lower abdomen, which had grown rapidly the last three months. I admitted her into the Hospital for Women, and on November 20, 1895, assisted by Mr Jordan, I performed pan-hysterectomy. I removed the right appendages with the uterus, but did not remove the left. The tumour was a multinodular myoma, weighing 6 lbs. She made a slow but uninterrupted recovery. Although at no time had she any serious symptoms, the wound was slow in heal-

ing, and she did not get up till the twenty-eighth day, nor leave the Hospital till the thirty-eighth day.

CASE VIII.—E. R., single, æt. 19, a delicate, anæmic girl, was sent to me by Dr H. Brown of Coventry. She had an occluded cervix, moderate distension of the fundus with menstrual fluid (hæmatometra), and double pyosalpinx. I admitted her into my private hospital, and on December 12, 1895, assisted by Dr Morgan, I operated. I first tried to reach the uterus per vaginam, and failed. I then opened the abdomen, and performed total extirpation of the uterus and both ovaries and tubes. The bladder was, unfortunately, wounded to a slight extent, and required suturing. The patient suffered from shock after the operation, and required free stimulation. She rallied well, however, and has since made a good recovery. She is now (January 8) getting up, and will return home in a few days' time.

Let me briefly summarize the above eight cases. There were six cases of myoma. Of these, one (Case I.) was small, and the rest were large tumours. There was one case of hæmatometra with pyosalpinx (Case VIII.), and one case of perforation of the gravid uterus by a hydatid mole (Case III.). This last case is, I believe, the only one on record in which this very rare condition has been diagnosed and successfully treated by surgical operation. In two cases (Case I. and Case V.) I had previously removed the uterine appendages, but without any benefit to the patient. In two cases (IV. and VI.) the myoma was cystic. Three of the cases were operated on at the Birmingham Hospital for Women, four in my private hospital, and one at the patient's own house. Several of the patients were unfavourable subjects for a severe operation. Cases I. and VIII. were delicate, strumous subjects. Case V. was profoundly anæmic, and exhausted by chronic hæmorrhages; and Case III. was collapsed, and nearly moribund from acute internal hæmorrhage. I therefore feel I am fortunate in not having to record a single fatal case.

Dr Berry Hart congratulated Dr Martin on his most brilliant paper. Some of the cases were unique, and, so far as he knew, no one had previously diagnosed such a case as that of uterine perforation in hydatid mole, far less operated on it successfully by total extirpation. His own opinion agreed as to operations in fibroids with that of Dr Martin. He approved of removal of the appendages in suitable cases, and of total extirpation in those where the uterus was too large for the former operation. Dr Martin had evidently improved the technique of the latter operation, and his success was most encouraging.

Dr N. T. Brewis had much pleasure in congratulating Dr Martin on the lucid description which he had given of pan-hysterectomy,

and on the excellent results which he had obtained in the cases operated on by him. When a myomatous uterus required to be removed, he (Dr Brewis) was of opinion that the operation just described was the best one, and he had no doubt it would become the operation of the future. The most difficult part in the technique is the tying of the uterine arteries, chiefly from their position and their close relation to the ureters. Dr Brewis had found that they become more accessible when the patient is in the Trendelenburg position, and the danger of including the ureters in the ligature is abolished when the operator passes probes along them after the method of Kelly. He considered that the extra-peritoneal operation, with Koëberle's wire constrictor, had still a place in the treatment of these tumours, chiefly on account of the rapidity with which the operation could be performed, and he would always prefer it when he had a feeble patient to deal with. In the cases which Dr Brewis had operated on by this method he was well satisfied with the results, and he had not found that they were followed by hernia more than other abdominal operations were, though certainly the convalescence was more prolonged. He also held that there was a class of cases where removal of the appendages gave the desired results, viz., in tumours which did not extend above the pelvic brim. If the ovaries and the whole of the tubes along with the broad ligaments as low down as beneath the round ligaments were removed, one can in nine cases out of ten make sure of the cessation of the growth of the tumour. At any rate, such was his experience.

Dr Martin, in reply, thanked Dr Hart and Dr Brewis for their kind criticism of his paper. He could only find some seven or eight cases on record of "perforating hydatid mole"—all discovered post-mortem. He believed his own to be the first case that had been diagnosed during life and saved by surgical interference. The "clamp" operation was undoubtedly an easier and more rapid proceeding than pan-hysterectomy, but it was more fatal. He did not use the Trendelenburg posture,—(*a*), because vessels which did not bleed in this position might do so after the wound was closed, when the patient's legs were lowered; (*b*), because of the tendency of blood to gravitate towards the diaphragm and escape notice; (*c*), because by traction on the uterus the pelvic floor became quite accessible. So far he had had no trouble from the ureters, and he did not catheterise them. But he could quite see that such a proceeding might be of great service in difficult cases, as undoubtedly the great danger of the operation was ligation, or division of the ureter.

VIII. CASE OF FATAL INFANTILE JAUNDICE FROM CONGENITAL NARROWING OF THE COMMON BILE-DUCT.

By J. A. C. Kynoch, M.B., M.R.C.P. (Ed.), Dundee.

In a recent volume of the Society's *Transactions* there appears an elaborate paper on Congenital Obliteration of the Bile-ducts, by Dr John Thomson.

In this paper he has collected all the published cases, dividing them into two groups, the first including the larger number, where the passage of bile into the duodenum was impossible owing to obliteration of some part of the bile-ducts; the second group including a smaller number of cases where the bile-ducts, although permeable, were not sufficiently so as to permit of the passage of bile during life.

The following are the notes of a case coming under this latter group, of interest from the condition of the common bile-duct causing obstruction to the passage of the bile.

Matilda Chisholm, aged 3 months and 4 days, was brought to the out-patient department of the Dundee Royal Infirmary when 2½ months old, on account of persistent yellowness of the skin, which the mother stated had been noticed since birth. At first the yellowness was most marked on the chest and abdomen, but five weeks after birth the conjunctivæ were noticed to be also affected.

The father, a millworker, has always enjoyed good health, and denies having had any form of venereal disease.

The mother, who has had two children, appears to be healthy, has had no miscarriages, and except for a sore throat during her first pregnancy at the fourth month, her health has always been good.

The other child, a boy 14 months old, is perfectly healthy, has had no symptoms suggestive of congenital syphilis; had jaundice for two or three days after birth.

During her second pregnancy the mother enjoyed good health; the child was born at full time, and her labour was uncomplicated.

At birth the child was considered small, and from the *first* day the skin was noted to be very yellow. There was never any hæmorrhage from the umbilicus nor from the bowels, mouth, or nose. It was bottle-fed, and had occasional attacks of vomiting. There never were symptoms suggestive of congenital syphilis.

When seen for the first time it was noted to be very emaciated, and the skin had a yellow-green colour, the conjunctivæ being likewise affected.

There was considerable distension of the abdomen, especially marked over the right side. On palpation the liver was felt to

be enlarged, its lower edge sharp, and on percussion in the mammillary line the dulness extended from the fifth rib to midway between the costal margin and umbilicus. The spleen was not felt below the costal margins some days later when the attempt was made for the first time. Examination of thorax was negative. Grey powders, ½ gr. twice daily, were prescribed (so as to keep it attending the Infirmary). It was seen twice a week during the three weeks it attended the Infirmary. There was never any improvement noted; the skin always appeared to become greener in appearance, although the mother stated that the intenseness of the jaundice varied. The emaciation was progressive, and during the last week of attendance there was noted marked redness and swelling of both eyelids, especially the left, with greenish-yellow discharge and a filmy appearance of both corneas, which became slightly opaque two days later.

The stools from the day of birth were white and milky, and on several occasions I was able to satisfy myself of this putty-like colour. The urine was dark, and stained the linen yellow. On examination it contained bile pigment; no albumen. Microscopic examination not made.

A post-mortem was made, and the abdominal organs removed. The thorax was not examined. The skin was noted to be of a greenish tinge; body very emaciated. On opening the abdomen the peritoneum appeared perfectly normal; there were no adhesions and no ascites.

Liver enlarged, 237 grammes = 8 oz. Length of upper surface, 6½ in.; length of lower surface, 5¾ in. Antero-posterior—Right lobe, 4¼ in.; left lobe, 3¼ in. Its edges are sharp, colour olive green, consistence tough; fibrous bands of a yellow colour are seen on surface, which is somewhat irregular. Gall-bladder flaccid, and contains thin bile; capsule not thickened, and on squeezing a cut surface brownish fluid exudes. Both hepatic ducts appear normal, likewise the cystic duct. The common duct immediately below the junction of the cystic and hepatic ducts appears to be of normal calibre, but from this point it gradually becomes narrower, having a thread-like appearance in the lower part of its course. It ends in a well-marked papilla on which no orifice could at first be seen with the aid of a lens, but on pressing the gall-bladder bile passes easily into the upper part of the duct, the passage from this point downwards into the duodenum being slower.

Spleen measures 2¾ in. longest diameter; 1¾ in. transverse diameter; weight, ¾ oz. Kidneys appear normal, 14 grammes. Intestines normal, and contain cream-coloured mucus; no blood corpuscles. Microscopically.—Several sections examined appear perfectly normal, in others there is slight biliary cirrhosis.

With regard to the health of the parents, syphilis can, I think, be excluded. The sore throat referred to appeared, on questioning

the mother, to have been of the nature of an ordinary catarrh, and there were no other symptoms pointing to syphilis.

The other child appeared healthy, and the jaundice it is reported to have had was most probably the ordinary form of jaundice neonatorum.

The duration of life (3½ months) is longer in this than in the other published cases, which may be accounted for by the complete absence of hæmorrhages.

The case further shows, as Dr Thomson has pointed out, the close resemblance between those cases with pervious ducts and those where the obliteration is complete.

IX. CURETTAGE OF THE UTERUS: HISTORY, INDICATIONS, AND TECHNIQUE.

By J. W. Ballantyne, M.D., F.R.C.P.E., F.R.S.E.

It is now eighteen years since Dr James Carmichael communicated to this Society a paper by Dr Paul F. Mundé of New York on "The Dull Wire Curette in Gynecological Practice," and this paper was immediately followed by, and was, indeed, the direct cause of, one from the pen of the late Dr Keiller, on "Curettes and Curetting." Since that time no further communications on uterine curettage have been made to the Society; in fact, the matter has only been referred to incidentally in two or three papers devoted to other subjects. Yet there can be no doubt that in the eyes of the profession this operation occupies a very different position now from what it did nearly twenty years ago. The prophetic words of Dr Keiller have been largely fulfilled, for he said (in the communication above referred to) that he was "strongly impressed with the idea that curettes and curetting would become so fashionable amongst us that there might be a rushing after them;" but let us hope that the latter part of his prediction has not and never will come true, for he went on to say, "and that the already sorely-tried and long-suffering uterus might thereby be the reverse of improved."

It has, therefore, seemed to me that it may be both opportune and profitable for the Fellows of the Society now to record their estimate of the value of uterine curettage, and their views as to the kind of case most likely to be benefited by its performance. In order to further this end I shall give in the following pages a brief account of the history of the operation, along with a statement of the pelvic conditions in which it appears to be most clearly indicated, illustrated by instances occurring under my charge. I shall also describe the method of using the curette which has seemed to me the most convenient and the safest.

Personally, I have been familiar with the operation since 1881, when as a senior student I saw and assisted at cases in which it

was carried out in the Edinburgh Royal Infirmary. During the first half of the period of fourteen years which has elapsed since then my notions regarding the technique of curetting and the conditions calling for its employment were largely founded upon what I was constantly seeing in Professor Simpson's private and hospital practice, and upon what I had witnessed of the operation in the hands of the German gynecologists whom I visited in 1885; during the last seven years, however, my knowledge has been supplemented and in certain ways modified by the experience gained from the use of the curette amongst my own private and dispensary patients.

Historical Notes.

The history of the uterine curette prior to 1878 has been summed up by Mundé in his paper referred to. In 1850 Récamier (1)[1] noted that metrorrhagia was sometimes caused by what were called intra-uterine fungosities, and in such cases advised the introduction of a sort of scoop with subacute edges into the uterus and the scraping of its interior therewith. Although correct in theory, Récamier's recommendation proved little short of disastrous in practice, for three cases of uterine perforation and death were soon reported,—a result which led, not unnaturally, to the almost universal condemnation of the curette not only in France, but also in Germany and England. Little was heard of the instrument for fifteen years, and then (1865) Dr J. Marion Sims showed to the Obstetrical Society of London the curette which still bears his name, venturing at the same time to characterise curetting as a practice "now recognised as legitimate" for removing intra-uterine fungoid granulations when productive of menorrhagia. He preceded the use of the instrument by the introduction of a sponge tent and by the digital palpation of the cavity of the uterus when cervical dilatation had been accomplished; he placed the patient in the left lateral semi-prone position and introduced his speculum; and before passing the curette he laid hold of and steadied the cervix with a tenaculum.

Notwithstanding Sims' statement that curetting was recognised as a legitimate procedure, Courty, writing a year later (1866), said that he had almost wholly discarded it on account of its danger; and for the next few years the text-books on gynecology continued to damn the curette with faint praise. Sims' countrymen had, however, given a warmer welcome to Récamier's instrument than the gynecologists of Europe, for we find Dr Noeggerath stating at a meeting of the New York Obstetrical Society in 1871 that he had used it twenty times with no unpleasant results, and without the previous introduction of the sponge tent, which he regarded as unnecessary and dangerous. Other speakers, however, at the

[1] The figures within parentheses refer to Literature at end of paper.

same meeting reported cases of hysterical tetanus (with recovery), collapse (with death), and cellulitis following the use of the curette.

In 1872 Simon (3), in Germany, brought before the notice of the profession his spoon curette, an instrument which like Sims' was sharp, was made of steel, and was, therefore, inflexible. Simon, however, does not seem to have applied his sharp spoon to the endometrium, for he spoke specially of its use for scraping out sarcomatous and cancerous growths in the cervix, rectum, and vagina; but Hegar and Kaltenbach and others did not hesitate to apply it to the interior of the uterus, and reported good results. To another American, T. G. Thomas (6), belongs the credit of having invented a curette less formidable than the above-named instruments, and equally efficacious in, at any rate, chronic hyperplastic endometritis. Thomas's curette, introduced in 1874, consists of a wooden handle carrying a flexible shank of soft copper wire with a loop at the end, by means of which intra-uterine granulations could be detached and removed. The instrument, however, cannot be said to have acquired a reputation outside the United States till 1878, when Dr Paul F. Mundé (7) brought it prominently before the notice of the profession in this country by means of his paper communicated to our Society, and gave to it an impetus into popularity by quoting Thomas's saying that he had used it "hundreds upon hundreds of times" without the least ill effect therefrom. In the discussion which followed the reading of Mundé's paper it was elicited that Professor Simpson had for many years been using Récamier's curette without bad effects, but always with previous dilatation of the os, and that Dr Keiller had also for a long time been curetting with a blunt instrument in some ways resembling that of Thomas, but with a strong feeling that the curette should "be handled at all times with the utmost caution."

This brings the history of uterine curetting up to the year 1878, when, to state the matter briefly, Récamier's, Sims', or Thomas's curette was used, and uterine hæmorrhage, whether due to fungous endometritis, to retained products of conception, or to sarcoma of the corpus uteri, was practically the sole therapeutic indication for the operation; for scraping the cancerous cervix with the curette could scarcely be called a special use of the instrument. The operation was often performed without an anæsthetic, in the medical man's consulting-room or at his dispensary, and with or without previous cervical dilatation. It should also be noted as significant that Mundé believed that the first and chief use of the curette was as a means of diagnosis.

Prior to 1878 about half a dozen communications devoted to the consideration of the uterine curette had appeared, and the instrument was mentioned in only one or two gynecological text-books. Since 1878 one hundred and fifty-three papers and monographs

have been published dealing specially with curettage, and of these fifty-five have appeared in France, forty-seven in the United States, nineteen in Germany, eight each in Great Britain and Belgium, five in Italy, two each in Russia and Denmark, and one each in Spain, Norway, Switzerland, Roumania, Canada, Mexico, and Cuba. Further, the curette and its mode of use are now fully described in every gynecological treatise worthy the name. Of course this even does not exhaust the literature of the subject, for many articles dealing with such subjects as endometritis, post-abortum septicæmia, and uterine neoplasms contain references, more or less direct, to curettage.

One of the first extensions in the use of the curette in the years immediately following the reading of Mundé's and Keiller's papers was in the direction of the treatment of intra-uterine septic conditions occurring two or three weeks after abortion, and with or without parametric or perimetric inflammation. To fit the curette for these purposes its stem was made hollow and a stream of antiseptic fluid was sent through it so as to wash away fragments of the endometrium as soon as they were detached. Thus the irrigation-curette came into existence, types of which are the instruments of M. B. Freund (16), of Rheinstaedter (21), of Noeggerath (24), Longyear (30), Auvard, Duke, and others.

About this time (1882–85) the question began to be raised whether curetting might not prevent future conception, or at any rate render it difficult. This idea, which was supported by B. Schultze, was controverted by the results obtained by Düvelius and Benicke (23). The last-named writer gave details of ten cases in which pregnancy occurred after curettage (for endometritis hæmorrhagica and retained membranes) at a period of from four weeks to seventeen months thereafter. The conclusion drawn was that curetting increased rather than diminished the chances of future conception, and this conclusion has since been repeatedly confirmed.

Between 1883 and 1885 Weckbecker-Sternefeld, Pick, and Plönies (25) began to report cases of puerperal endometritis with retained products of conception and signs of septic infection in which the sharp spoon was used, sometimes, although not always of course, with success. There were many who regarded the extension of the use of the curette to obstetric practice with no favour, and even at the present time there is by no means a general recognition of its value in puerperal septicæmia. About this time also the employment of the scoop in cases of cancer of the body of the uterus began to be much discussed, Terrillon (26) and others speaking in its favour, and Ménière (27) against it.

A paper by Smyly (31) on the curette in the diagnosis and treatment of diseases of the uterine mucous membrane, read before the Academy of Medicine in Ireland in 1886, led to some adverse criticism, one speaker stating that he regarded the instru-

ment as a dangerous one, without diagnostic or therapeutic value. At this time there can be no doubt that in Great Britain the curette was not widely employed. It may be noted as a matter of some slight interest, that in 1887 Guinon dilated and curetted the uterus of a hysterical patient during the hypnotic trance. In the same year Geyl (39) reported a case of complete paralysis of the uterine muscle during curettage.

At one time it was hoped that in this instrument a useful means of palliative treatment for uterine fibroids might be forthcoming, and in 1888 H. C. Coe (46) wrote in support of this opinion; but, on the whole, later results have not confirmed the anticipations with which this extension in therapeusis was made. In the same year Desprèaux (47) considered the whole subject of curettage very fully in a thesis of Paris. Burt (43) reported one hundred and fifty cases without a death, but almost at the same time Jackson (44) had to put two fatalities on record.

In 1888, also, there were signs that a belief in the curette-treatment of puerperal endometritis was making headway, at any rate in America; both Coe and Earle stated that if the intra-uterine douche does not bring down a high temperature in the puerperium, then the curette should be brought into action. The question began about this time to come to the front, whether in such cases as the above in which there is fever and hypogastric tenderness, the existence of disease of the uterine appendages and even of the peritoneum should be regarded as a contraindication to curettage. During the last four or five years this matter has been warmly debated, and cannot yet be said to be definitely settled. The same remark applies to the use of the curette in the treatment of chronic and recurring tubal and peri-uterine inflammations; but such results as those obtained by W. M. Polk (104) hold out great hopes for the future. At the same time Bland Sutton and others deny that purulent collections in the tubes can ever spontaneously pass into the uterus.

It is unnecessary to pass in review the long list of papers, in many languages, which have during the last few years been devoted to the consideration of the curette; their full references will be found in the accompanying bibliography. Some of the recent extensions in the scope of the instrument will be specially referred to under the indications; but the papers of Bossi (132) and Werth (159) have an important bearing upon the modus operandi of curettage, and call for more than passing notice. These observers investigated the condition of the mucosa and its reproduction after the uterus had been scraped. Bossi was able to examine some uteri which had been removed by hysterectomy from twenty-five to twenty-seven days after curettage, and in them he found the endometrium histologically completely renewed. In one case in which the organ was removed fifteen days after scraping the mucosa was well reproduced, save in one or two places where the

epithelium was defective. Clinically he found that the new endometrium was able to serve as the nidus for an ovum from twenty-five to twenty-nine days after the use of the curette, as was shown by seven cases in which conception occurred at this time; in these instances pregnancy and labour were normal. In experiments upon the lower animals (dogs) the mucosa was not so quickly renewed, probably because experimental curettage done by sight was more thorough than uterine scraping in the human subject.

Werth's paper was also important, for it showed that in the case of uteri removed after curetting the endometrium was never entirely removed. Some areas, especially near the cornua, were often left untouched, whilst the anterior wall was usually well denuded; further, the depth of the mucosa removed varied very much. In the cases in which the curette did not penetrate to the muscular coat there was found a mucosa with glands opening on the free surface in from eight to ten days; but where the muscularis had been reached, even after the lapse of seventeen days there were still bare areas. New epithelium was observed as soon as the third day after curetting in some cases, and Werth believed that the glands were reproduced from the extremities left embedded in the muscularis mucosæ. These papers have a special value in enabling us to form some idea of the changes consequent upon curettage.

If we contrast the position of the curette now with that it occupied in 1878 we shall be struck with the great increase in popularity and extension in application which it has achieved in these eighteen years, as compared with its slow growth in favour during the twenty-eight preceding years. I believe I am right in saying that the curette is now scarcely ever employed without previous dilatation and anæsthetisation; that it is used in the hospital rather than in the dispensary, and with the patient in bed rather than on the consulting-room couch; that the sharp curette, flushing or not flushing, is the instrument of choice; that the operation is looked on as one requiring as much care, caution, and skill as any in minor gynecology; that in some cases it comes to have even the importance of a major operation; and that it is now as a therapeutic and not as a diagnostic agent that it has won its greatest triumphs and most widely extended its field of usefulness.

Indications.

It has doubtless been gathered from what has been said of the history of the curette, that the indications for the employment of this implement have greatly increased during the last few years. It is now more frequently used than it was some time back, and it is used in cases in which it would previously have been regarded as inappropriate and even as dangerous. These indications may

be roughly divided into therapeutic and diagnostic, and under each of these headings are grouped conditions, obstetrical as well as gynecological, which call for the use of the curette.

Indications.

A. Therapeutic Uses.
- I. Hæmorrhage.
  - *a.* Uterine.
    - 1. Corporeal.
      - *α.* Retained products of conception.
      - *β.* Non-septic Endometritis.
      - *γ.* Fibro-myomata.
      - *δ.* Sarcomata and Carcinomata.
    - 2. Cervical.
  - *b.* Vaginal.
    - Carcinoma and Epithelioma.
- II. Septic and Infected States.
  - *a.* Uterine.
    - 1. Acute Endometritis.
      - Septic or gonorrhœal.
    - 2. Chronic Endometritis.
  - *b.* Annexial.
    - Pyosalpinx, etc.
- III. Dysmenorrhœa and Sterility.
- IV. Induction of Abortion.
- V. Preliminary to other Gynecological Operations.
- VI. Chronic Cystitis.

B. Diagnostic Uses.

A. Therapeutic Uses.

I. In Hæmorrhage from the Genital Organs.—Hæmorrhage is one of the classical indications for the use of the curette; it is also the one about which there is the least difference of opinion. The bleeding may be uterine or vaginal in origin, and in the former case it may come from the body or from the cervix.

a. Uterine Hæmorrhage (Menorrhagia and Metrorrhagia).

1. Bleeding from the *body of the uterus* may be due, *first*, to retained products of conception; *second*, to endometritis without septic infection, but often with subinvolution and displacement; *third*, to fibro-myomata; and, *fourth*, to malignant uterine growths. Let us look at these various conditions as indications for uterine curettage.

α. Retained Products of Conception.—Very frequently after an abortion, and especially after one which has not been under t e

care of a medical practitioner, a portion of the decidual or fœtal membranes is left behind *in utero*. The derelict tissue need not be large in size to cause bleeding; in fact, an apparently insignificant portion may suffice to set up and maintain excessive hæmorrhage. There may be no signs of infective processes in the uterus, indeed, I am dealing now with the cases in which these are absent; yet the uterine bleeding will continue, the patient's strength will become exhausted and her health vitiated, and a morbid uterine mucous membrane will be developed unless the uterus is promptly relieved of its offending contents. In cases in which the abortion is a recent matter it will often be found that the cervical canal is still sufficiently open to admit the finger, and the uterus may be easily and effectively cleared out under chloroform. In such an emergency the finger is the best curette, it being always borne in mind that as strict antiseptic precautions must be taken as if the curette itself were being used. I am not, therefore, an advocate for the management of all cases of abortion with the curette; but in cases of habitual abortion, in which there is reason to believe that an unhealthy uterine mucosa is the cause, it is distinctly indicated. In the instance, however, in which several days or some weeks have elapsed since the abortion occurred, preliminary dilatation of the cervix will be needed, and something more thorough than a mere digital scraping of the uterine interior must be done, for by this time the decidual fragment has probably become firmly attached, and a new and doubtless an abnormally vascular uterine mucosa has been or is being formed. Such is a suitable case for curetting, and in illustration the following instance may be cited.

Illustrative Case.

Case of Mrs A. Retained Products of Conception: Curettage.—Mrs A., a recently married woman, 25 years of age, aborted at the third month of her first pregnancy (March 23, 1895). Considerable hæmorrhage occurred, and the ovum was expelled in fragments. Some bleeding continued till the 4th of April; thereafter the patient seemed well till the 13th of the same month, when, after a good deal of walking, hæmorrhage recurred in a rather alarming gush. This continued to occur at intervals of a few days, and I was consulted about the case on April 30. It was evidently a case of retained products of conception without (for the present) any signs of sepsis, so I curetted the uterus on May 1. The patient was anæsthetised, and the cervical canal dilated with Hegar's cones in the usual way. Some fragments of decidual membrane were brought away with the curette; the interior of the uterus was washed out and then cauterised with iodised phenol; and an intra-uterine plug of iodoform gauze was inserted. No further hæmorrhage took place, and the patient made a good recovery. She had a very profuse discharge at her next menstrual period,

which gave her some alarm. This is a phenomenon which is not infrequently met with after curettage; I do not pretend to explain it. All the succeeding periods have been perfectly normal.

β. Non-septic Endometritis.—It was for the purpose of removing from the uterine cavity what were known as fungosities that Récamier originally introduced the curette, and in meeting this indication the instrument may, at the present day, be said fully to maintain its reputation. It is now recognised that these fungosities are associated with and dependent upon chronic endometritis, —that they are, in fact, the hypertrophied uterine mucosa, and that the organ in which they are found is commonly displaced, and is nearly always in a state of subinvolution. The condition is frequently met with; it may originally have been set up by a labour or a miscarriage, or it may have taken origin in any of the ways that chronic endometritis does; it may persist for a long time, showing usually a steady tendency to increased severity in its manifestations; it brings with it menorrhagia, metrorrhagia, leucorrhœa, sacralgia, anæmia, and general depreciation in health, and it entails sterility; the uterus is large (sound passes in from 3 to 4½ inches), tender, and often displaced; and the morbid state shows no natural tendency to cure, but rapidly becomes normal after the cavity of the organ has been thoroughly curetted and cauterised. The following case may be cited as a type of this use of the curette.

Illustrative Case.

Mrs B., aged 32 years, came to me for advice in the early part of January 1895. She was married, and had three children, of whom the youngest, a boy, was 8 years old. She had been in bad health ever since the birth of this child eight years ago, and had recently been getting worse. She complained of excessive menstrual loss, the discharge lasting for fully seven days; recently the periods had been occurring every three weeks. There was no acute pain at the monthly epoch, but rather a dragging sensation in the pelvis, which lasted for a week after the flow had ceased. There was a good deal of leucorrhœa in the intermenstrual period. Recently she had been showing signs of anæmia—breathlessness, palpitation, etc.—had to a large extent lost her appetite, and had developed troublesome constipation.

Physical examination showed that the lungs and kidneys were sound; there were anæmic bruits to be heard over the base of the heart, but no signs of organic disease; and there were all the manifestations of a chronic dyspepsia. The vaginal and bimanual examination revealed a large, slightly sensitive, freely movable uterus, situated rather low down in the pelvis, but not otherwise out of position. The uterine sound entered to a distance of 3¾ inches, its passage gave a little pain, and its tip was seen to be blood-stained when it was withdrawn. With the sound in position it could be felt that the uterine walls were thicker than normal.

The uterine appendages showed no signs of disease, neither was there sharp pain on pressure in the lateral parts of the pelvis. Perineum was intact.

The diagnosis of hyperplastic endometritis of a chronic kind was made, and it was concluded that the morbid process had begun eight years previously in the puerperium following the birth of the youngest child. At any rate she had then been kept in bed for several weeks by her medical attendant for "inflammation." There was no sign of annexial disease, and the case was therefore evidently a most suitable one for curettage. (Medicinal means and vaginal douching had been tried without effect.) A sharp attack of influenza caused the postponement of the operation till April 8, when it was performed on the day following the cessation of the menstrual flow. The preparations for the curetting were the usual ones, and the operation itself had no feature of special interest. The scraping removed a thickened and vascular mucosa; iodised phenol was applied to the emptied cavity; and an intra-uterine packing of iodoform gauze was inserted, which was removed three days later. There was some pain in the back for twenty-four hours, but after that recovery was uninterrupted, and the patient was able to go to the country for a change in a little more than a fortnight. Her menstrual flow came on in May, lasted only three days, with a slight return on the sixth day from over-exertion, and was moderate in quantity. "The first time she had had a natural period for seven or eight years" was what she told me. Since then she has been in the enjoyment of perfect health, although she has not again become pregnant. The uterus is now of normal size, and occupies a healthy position in the pelvis.

Even in cases in which the endometrium does not show the polypose growths which are so characteristic of this type of chronic inflammation, curettage is still indicated if the symptoms which call for it (viz., hæmorrhage, leucorrhœa, backache, etc.) are present in sufficient severity. Of course, it is practically impossible to separate these from what are called the "chronic infected cases," in which an old septic or gonorrhœal infection has been the *origo mali*, but in which the virulence of the process has passed off. The separation is, however, unnecessary, as the same treatment may be meted out to both.

γ. *Uterine Fibromyomata.*—There is at present no very strong feeling in favour of the use of the curette in uterine fibroids. In certain cases the uterine mucosa has been found in a hyperplastic state, and has even shown fungosities when myomata were present; but the observations of Oscar Semb ("Ueber das Verhalten der Uterusschleimhaut bei Myomen," *Arch. f. Gynæk.*, xliii. p. 200, 1893) have shown that in most instances the hæmorrhage is due to hypertrophy and congestion of the muscular rather than of the mucous coat; indeed, in some cases there was actually an atrophic endometritis. When the curette is employed it is difficult to see

how it can effect more than a temporary benefit, and if the endometrium be atrophic it will not even act as a palliative. A few cases are on record in which involution followed curettage, but in them there was no myoma. Nevertheless, Orloff (128), working in Professor Lebedeff's Clinic, has found good results in ten cases in which the uterus was curetted for myomata of the interstitial type. In all the instances, save one, the tumour was single, and in all the leading symptom was hæmorrhage, not pain. Tincture of iodine was applied to the interior of the uterus after curetting. The results were diminution in the size of the tumour, decrease in the length of the uterus, disappearance of the metrorrhagia, and a return of the regular menses during a period varying from six months to one year. Orloff was of opinion that curettage was indicated when the patient was too weak from blood loss to undergo a major operation, or when she was not far from the climacteric; it might also be of service as a preliminary to further surgical interference. Whether or not curettage may act as a valuable palliative in some classes of uterine myomata is not yet certain; but it is obvious that it is not applicable in all.

δ. Uterine Sarcomata and Carcinomata.—Apart from its use as a diagnostic means in malignant growths of the corpus uteri, the curette is here of little value. The only treatment that presents a fair chance of success is hysterectomy, preferably per vaginam, performed early. If it be too late to hope for any success from extirpation of the uterus, then the patient's sufferings and misery may be lessened by curettage of the organ, followed by free cauterisation. In cases of sarcoma uteri where this has been done I have seen the patient's state greatly improved; but, of course, the relief was quite transient, and it was scarcely possible to think that life was prolonged.

2. Bleeding from the *cervix uteri* is an occasional indication for the sharp spoon; the condition calling for it is nearly always cancer, and what has been said regarding its use in sarcoma of the body of the organ may be repeated here. The curettage is at best a palliative, although it has been known to be followed by a respite of even two or three years; but it is worth doing if it only serves to diminish the hæmorrhage, and to stop for a time the systemic infection from the breaking-down of cervical tissues. A curette with serrated edges has been specially recommended for this purpose; great care must be taken not to invade neighbouring organs, and the scraping should be followed by free application of the Paquelin cautery at a dull red heat.

b. Vaginal Hæmorrhage.—Vaginal carcinoma and epithelioma, secondary or very rarely primary in character, may, on account of hæmorrhage and other discharges, call for the use of the curette; but this instrument must be employed with the greatest caution, and, of course, it is with a view to palliation only that it is recommended.

II.—In Septic and other Infected Conditions of the Genital Organs.—Nearly all the text-books of gynecology which are more than half a dozen years old, and not a few of the much more recent ones, place sepsis as a danger resulting from and not as an indication calling for the use of the uterine curette. In fact, it is barely two years since Berry Hart, in a fresh and eminently suggestive paper on the classification of gynecological diseases, read before this Society, stated, in reference to chronic infected cases, that he had seen cellulitic thickenings disappear after curetting. Hart then went on to say: "This heresy, as one may almost call it, is truth, I believe; but it is strong meat, and liable to be abused by the inexperienced." It can scarcely be called heterodox now, and if it be strong meat, still there can be no doubt it is a pabulum eagerly sought after, and assimilated more or less perfectly by even the tyro. A glance over the titles of articles in medical journals all over the world demonstrates this fully.

Now, the change in the views of the profession has not come about through want of appreciation of the danger of sepsis entailed by the use of the curette. Not at all. We still regard the curettage of the uterus as an operation not free of risk, but we take care to minimise its dangers by strict antisepsis; we no longer perform it in our consulting-rooms; and we hedge its performance round with the greatest care and forethought. What has happened is this. We have gradually come to learn that nearly all, if not all, the septic and infected conditions of the genital organs spring from micro-organismal infection of the endometrium, either primarily, or secondarily from vaginal infection. The streptococcus or the gonococcus obtains a lodgment in the uterus, and endometritis is set up; sooner or later, and more commonly soon than late, the infection spreads to the tubes, and having reached them it does not take long to pass through their fimbriated extremities into the peritoneal cavity; virulent peritonitis, and, secondarily, suppurative cellulitis are thus set up. All these processes—septic or specific endometritis, salpingitis, pyosalpinx, ovarian abscess, peritonitis, and cellulitis—are simply links in a chain of pathological results. If we can prevent the forging of the utero-tubal link we stop the formation of the chain effectually. This I believe we can do; I have seen it done; I have done it myself both in acute and chronic sepsis.

In a discussion (118) on curetting the puerperal uterus, in the Chicago Gynecological Society, Dr Charles Warrington Earle said: "I believe that curetting a uterus after delivery at full term involves more responsibility than an ordinary and uncomplicated laparotomy." So it does. I agree with Dr Earle; *but* when I prepare to curette the puerperal uterus I am face to face with dangers to life infinitely more pressing than those that meet the man who is about to perform "an ordinary and uncomplicated laparotomy." Such a laparotomy is undertaken commonly for

conditions which would not immediately terminate fatally, whilst the occasion of the curettage is a puerperal septicæmia, and everyone knows that that means, in the vast majority of cases, either immediate death or lifelong misery from pelvic abscesses, adhesions, and chronic invalidism.

Under the head of septic and infected states there are several separate groups of conditions in which curetting may be employed. With regard to some of these there is still some doubt in the mind of the profession as to the justifiability of the operation; possibly some medical men would consider it as contraindicated in them all.

a. Uterine infected states (Endometritis septica, etc.).—Of the uterine infected states which may require curettage, should other and milder measures fail, the most important is undoubtedly septic endometritis, acute or chronic.

1. *Acute.*—Most commonly acute septic endometritis is due to infection after abortion; it may also be post-operative, and be caused by neglect of antiseptic precautions in minor gynecological operations. There is a rigor, a high temperature, rapid pulse, pain over the uterus, and a purulent discharge from the cervix. Curettage is here indicated, and I believe the indication holds even if the Fallopian tubes have become involved. It ought to be thorough, and it should be followed by a complete packing of the uterus with iodoform gauze. Further, great care should be taken when the dressing is renewed, for the risk of reinfection is large. Septic infection may also follow labour at the full term, especially if there has been hæmorrhage, retention of a fragment of placenta or membranes, or a pre-existing state of unilateral pyosalpinx. Should one curette such a puerperal uterus? I believe one should if an intra-uterine douche, followed by iodoform gauze packing, fail to bring down the temperature. The following case will serve as a type of this group of indications.

Illustrative Case.

Mrs C., aged 30 years, v.-para, was confined on the morning of December 14, 1895. Her first child had been delivered stillborn with instruments; her second had also required forceps, but was still living. She has twice aborted. During this (her fifth) pregnancy she had been troubled with a vaginal discharge,—in fact, she has had this since before her marriage. Dr John Stevens, her medical attendant, reported that in the labour the head presented in the R.O.P. position; rotation occurred naturally, and the child was born alive without forceps. There was a severe hæmorrhage in the third stage, and the patient was much collapsed. She fainted and was unconscious for about an hour, but was revived by stimulants and ether hypodermically. The placenta and membranes seemed intact, but, naturally, they had to be removed very quickly from the uterus on account of the hæmorrhage. This was

on the morning of December 14; in the evening the temperature was 102°·6, and the pulse 130. On the morning of the 15th the temperature was normal, and the pulse 96; in the evening, however, it was 103°·4, and later 104°·5, whilst the pulse was 104 and 124. She got a vaginal douche. Next day (16th) the morning temperature was 98°·4, and the pulse 89; but again in the afternoon it rose to 103°·6, and the pulse to 118. She was douched thrice. On the fourth day of the puerperium (December 17) the morning temperature was 104° (pulse, 107); at 2 P.M. it was 103°·5, and an intra-uterine douche was given; at 8 P.M. it was 103°·8, and the patient was much exhausted. At this time Dr Stevens asked me to see the case with him. I found the patient very weak, with a temperature of 104°, and a pulse of 125; there was great tenderness over the uterus; there was scarcely any lochial discharge, but what came away was distinctly offensive. The vagina was hot and dry, and the uterus was very painful to touch. There was no cause for the high temperature in the lungs or breasts, and the diagnosis of acute septic infection from the uterus was made. After consultation we determined to try the affect of curetting, although the weak state of the patient did not hold out much promise of success. So at 11 P.M. she was anæsthetised and the external genitals and vagina thoroughly cleansed. One or two of the larger sizes of Hegar's dilators were introduced into the uterus, and I then passed in my finger, but could feel no pieces of membrane or placenta. Since, however, my finger failed to reach the fundus,—and I may here interpolate that the cervix was fixed and could not be dragged down in the vagina,—I now introduced the sharp curette (Récamier's), and succeeded in bringing away from one of the upper angles of the uterus a few shreds of particularly malodorous membranes. The uterine cavity was then thoroughly douched out (perchloride of mercury 1 to 5000) and packed with iodoform gauze. The vagina was also packed. The patient stood the chloroform well, but was a little faint after the curetting. She, however, stated that she felt easier. The temperature at midnight was 101°, and the pulse 95, and affairs remained in very much this condition till next morning, when the thermometer registered 101°·8, and the pulse-rate was 93. Respirations were 30. In the afternoon (December 18) I saw her again with Dr Stevens. The temperature, which at 2 P.M. had been 104°·8, was down again at 5 P.M. to 102°·8. The iodoform plug had been renewed, and a vaginal douche given. The urine had to be drawn off with the catheter. There was intense vaginal tenderness, but less abdominal pain. The breasts were giving rise to some trouble, so they were bandaged, and belladonna ointment was applied. A teaspoonful of the sulphate of magnesia was given every hour till the bowels had moved freely some five or six times; but there was still a large amount of abdominal flatulence and some tympanitis.

It would be tedious to state in detail the events of the next five

or six days. The packing was changed twice daily, and always came away soaked in purulent discharge; the urine had always to be drawn off; and the temperature varied in an erratic way from 103° to 100°·5, falling on December 22 (ninth day of puerperium) to 99°·9, rising again to 104° the same evening, and for the first time touching normal on December 24, when, also, the pulse was 71 and the respirations 24. A gradual improvement in the abdominal condition took place, the appetite improved as the tongue slowly cleaned, and on December 23 the patient began to be more hopeful about herself. About this date also the discharge ceased to be offensive, and douching was stopped. On the evening of the 24th, however, the temperature suddenly shot up to 104°·8, and there was some pain in the left hand and wrist; the bowels had not moved all day. This was only a temporary relapse, and since the 25th the temperature, pulse, and respirations have been normal, and the patient has been able to pass water. She is now (January 7) apparently quite convalescent; but a vaginal and bimanual examination reveals the thickening in the left broad ligament and the fixing of the cervix which have been present throughout the whole illness, and which were probably there before she became pregnant.

I am well aware that the line of treatment followed in the preceding case may be open to objections. Dumont (140) and many others have recently insisted strongly on the many dangers in connexion with the curettage of the puerperal uterus from perforation of the softened uterine wall, from the lighting up of slumbering annexial lesions, etc.; but in the case above recorded we were face to face with a condition already so grave that of the two kinds of treatment which were still untried, abdominal section and curetting, we unhesitatingly adopted the latter. Certainly the pieces of membrane could not have been removed in any way but by the curette.

What has been said regarding acute septic endometritis applies also to gonorrhœal endometritis, although it is true that systemic infection is not so severe in this type. The gonococci, however, soon invade the tubal mucosa and set up salpingitis and all the ills that follow in its wake, and, therefore, curettage is indicated, with all the more hope of success for the reasons that the micro-organisms are commonly found in the superficial layers of the uterine mucous membrane, and that further invasion takes place through the tubes and not the lymphatics.

2. *Chronic.*—It is probable that under the head of chronic infected states of the uterus ought to be placed many of the cases of so-called simple chronic endometritis. The uterus is enlarged, menstruation is disordered, there is purulent leucorrhœa, and sometimes pus is discharged in a gush; there is frequently uterine displacement, there is some pain over the uterus, but a down-bearing feeling is more common; there is often some thickening

or adhesions on one or both sides of the pelvis; and the patient usually refers her sufferings back to a post-abortum or post-partum period, or to the results of gonorrhœal infection, and states that she has been sterile since then. Not infrequently the cervix is enlarged, and protruding from the os are one or more mucous polypi. The symptoms I have named were all present in the case of Mrs D., which I may here take as my type.

Illustrative Case.

Mrs D., aged 34 years, was first seen by me on April 24, 1895. Seven years ago she was instrumentally delivered of a dead-born child. This was her first and only pregnancy. She suffered from abdominal pain and tenderness after the labour, and seems at that time to have had acute endometritis, followed by pelvic peritonitis. Her recovery was slow, and since that time she has had persistent severe dysmenorrhœa, and has never again become pregnant. Various palliative means of treatment had been tried without success, and on account of the intensity of her sufferings the patient had needed powerful narcotics at the menstrual periods. The pain then was agonizing; it came on regularly every month, and the flow was moderate in quantity, and it was worst on the first day before the discharge was fairly established. For this day, and frequently also for the one following, she had to keep her bed, and hot abdominal applications, as well as morphia suppositories, were needed. Sometimes an enema gave temporary relief, sometimes it did not. The pain was spasmodic in character, and was quite different from the constant dull, aching pain which was present in the intermenstrual period. I saw her in one of her worst attacks, and can vouch for the intensity of her menstrual suffering. She was also much troubled with leucorrhœa, which was generally worst when the pain was easier. Once or twice a purulent discharge had occurred in a gush from the passage. But for the uterine trouble she was in the enjoyment of good health, although she had had one or two serious illnesses.

Vaginal and bimanual examination revealed an enlarged uterus lying obliquely in the pelvis, with its fundus to the right and the cervix to the left side. The sound could only be passed with great difficulty and with some pain; it entered for a distance of about 3 inches. Two mucous polypi could be felt projecting from the cervix, which pointed to the front and left side. The uterus as a whole was retroposed as well as lateroverted, and it was firmly fixed in position. There was distinct thickening in the position of the left broad ligament, and the patient complained of pain on pressure over the left iliac region. The left Fallopian tube felt large, and the utero-sacral ligaments stood out distinctly at the borders of the posterior fornix.

As all sorts of palliative means had already been tried, I made up mind to remove, in the first instance, the mucous polypi, then

to dilate and straighten the cervix, and thereafter to curette if the condition indicated it. Accordingly, on May 4, 1895, being a few days after a menstrual epoch, the patient was anæsthetised, the vagina and genitals very carefully cleansed and disinfected, and the polypi twisted off. I encountered great difficulty in the dilatation of the cervical canal, partly on account of its narrowness and partly on account of its obliquity and of the fixed position of the cervix in the vaginal vault; but at length, by beginning with a No. 2 Hegar and proceeding very cautiously and deliberately, the cervix was opened up to the extent of admitting the forefinger. To the touch the uterine mucosa felt thick and slightly irregular, so the interior was scraped with the sharp curette, was cauterised with iodised phenol, and plugged with an iodoform gauze drain. The after-treatment was the same as usual; and with the exception of a rise of 1 degree of temperature on the night of the operation, and a little difficulty in passing water for twenty-four hours, the recovery was uninterrupted. At her next monthly period the patient, instead of having about twenty-four hours of acute agony, had three short and sharp attacks of pain, each lasting about an hour. This experience, she said, was a great improvement on the past. At the next period she had scarcely any sharp pain, only the dull, aching sensations that she always has in the pelvis. Since then even the latter kind of pain has gone, and she is practically quite well as regards the pelvic organs. Examination still shows some thickening in the left broad ligament, but the uterus is now much less fixed in position than before the operation. It may be mentioned that during the month following the operation there was copious leucorrhœa; this has now ceased.

b. Infected states of the Appendages.—I am well aware that I am treading on dangerous ground when I speak of curettage for disease of the Fallopian tubes, and I have not yet deliberately curetted a uterus with the intention of draining pus-containing tubes. The operation is still *sub judice;* in fact, there are some who would regard disease of the appendages as an absolute contra-indication to curetting even for simple uterine hæmorrhage. Whilst not sharing in the view of these gynecologists, I find it difficult to see how pus-containing tubes can be drained through the uterus, for this of course is the rationale of curettage in such cases; and my reason for thinking so is that in the observations on a considerable number of diseased Fallopian tubes which I made in conjunction with Dr J. D. Williams some time ago, the uterine orifice of the tube was invariably found blocked in hydro-, hæmato-, and pyo-salpinx. Still, certain cases which have been reported make one pause before making any definite statement on this point. Thus Liell (147) has recently (February 1895) given the details of a case in which a double pyosalpinx evacuated through the uterus; laparotomy, which had been meditated, was abandoned, and curettage was performed instead; pregnancy occurred two

years later, and the patient was safely delivered of a living child at the full term. Without instancing such a striking case as the above, W. M. Polk (104) has also brought forward a good deal of evidence to show that before performing laparotomy for recurrent salpingitis and peritonitis, it is well to give the patient a chance of the benefits that may and sometimes do follow curetting. Even if the operation fail the woman is in a better state to undergo laparotomy. Polk does not seem to be so sanguine as to expect any improvement to follow curetting when there is an abscess in the ovary as well as pus in the tube. Whether or not subsequent events confirm the teaching of Polk and others, their practice has done some good in checking the wholesale invasion of the pelvis by abdominal section, and in turning again the minds of gynecologists to more conservative methods.

III. Dysmenorrhœa and Sterility. — In a third group of indications for curettage I have placed certain kinds of dysmenorrhœa; but to some extent these have been already referred to under the head of endometritis and chronic infected cases. Of course every case of menstrual pain or of sterility, primary or acquired, is not a suitable one for the curette. It is doubtful whether uterine scraping is of the slightest avail in cases of maldevelopment of the uterus, and it certainly can do little, if any, good when the dysmenorrhœa is due to rheumatism or gout. But in membranous dysmenorrhœa it is clearly indicated; in fact, repeated uterine curettings offer probably the only real chance of cure. Then, again, in the cases of one-child sterility, where the uterus is enlarged and displaced, and in which there is great menstrual pain and leucorrhœa (as in Mrs D.'s case), curettage may make conception possible, or at any rate may diminish the dysmenorrhœa. Of course I should in such instances try other means of treatment first, such as ichthyol tampons and hot vaginal douches; but before removing the appendages in the dysmenorrhœa cases, and before subjecting sterile patients to a long course of treatment with pessaries (intra-uterine or vaginal) it seems to me to be fair, in properly chosen cases, to give curettage a chance. Possibly the accompanying cervical dilatation and the straightening of the uterus may be as powerful factors in the improvement as the curette; but it is certain that peri-uterine thickenings and adhesions do disappear in some of these cases. At any rate Travis Gibb (*Amer. Journ. Obst.*, xxxii. p. 257, 1895) reports sixteen successes out of twenty-six cases in which this treatment was adopted for sterility; in four of these also it is worthy of note that there were unmistakable evidences of tubal inflammation on one or both sides.

IV. Dangerous states in Pregnancy calling for the Induction of Abortion.—It must always be a very responsible matter to decide upon the induction of abortion, and one which

requires consultation with a brother practitioner; but when, for such a condition as incoercible vomiting in pregnancy which is threatening to become speedily fatal, it has been decided to empty the uterus, then cervical dilatation followed by curettage meets the requirements of the case admirably. Probably the dull curette is better for this purpose than the sharp. The operation is both rapid and effective, and in these characters it compares favourably with other methods of inducing abortion in cases where the patient is so weak that every drop of blood is of value and every minute of importance. Of course it is only applicable before the end of the third month of pregnancy. Admirable papers on this indication for the curette are those of Puech (155) and Blanc (110) in France, and of Caruso (121) in Italy.

V. PROPHYLACTIC OR PRELIMINARY PROCEDURE IN CONNEXION WITH MAJOR OR MINOR GYNECOLOGICAL OPERATIONS.—The employment of curettage as a preliminary to other operative procedures on the genital organs is by many regarded as novel; but I saw it in operation in Berlin in 1885. In all plastic operations on the vagina, such as colporrhaphy, perineorrhaphy, repair of the cervix or of a fistula, or amputation of the cervix, it will manifestly be an advantage if we can be sure that no source of infection lies above the seat of surgical interference. So long, however, as there is a state of endometritis, and especially if there be a purulent discharge from the cervix, there will be a great risk of failure of healing by first intention, it may be of breaking down of union altogether. Especially does this apply to the cases of perineorrhaphy for prolapsus uteri, in which that organ is most often in a state of chronic endometritis. The curettage should be done about a week before the plastic operation, and the uterus and vagina packed with iodoform gauze.

Curettage is also recommended and employed before hysterectomy (vaginal or abdominal) for malignant disease or for fibroid growths, and then its prophylactic and diagnostic uses can be combined. Even in cases of laparotomy for acute peri-uterine suppuration, Krug (100) and Pryor (105) have found that the uterus may be safely curetted before the major operation, and that the procedure greatly increases the patient's chances of recovery. Pryor (105), indeed, thinks that most of the distress following laparotomy is due to the neglected endometritis and not to adhesions, a secondary pyosalpinx being set up in the tube left in cases of unilateral salpingo-oöphorectomy. Here a note of warning is necessary, and I may give it in Krug's own words: he "believes that the tyro is no more entitled to attempt the preliminary procedure than he is to do the final laparotomy in such difficult and complicated cases." I may refer here, in passing, to Bovée's case (134) in which curettage was performed as a preliminary to laparotomy for ruptured tubal pregnancy; the

patient recovered. It has also been used before hysteropexy for displacement.

VI. CHRONIC CYSTITIS.—It remains to be stated that a possible therapeutic indication for the curette in gynecological practice is to be found in certain intractable cases of chronic cystitis. Under these circumstances, ordinary means of treatment having, of course, been tried and having failed, the medical man is left with only such troublesome expedients open to him as dilatation of the urethra or the making of an artificial vesico-vaginal fistula. In such instances Dr J. Verhoogen of Brussels (118A) has advised and practised vesical curettage. In four cases of chronic cystitis he reports a cure, and in three of tubercular cystitis, amelioration; but with regard to this use of the curette I have no personal experience to go upon.

B. DIAGNOSTIC USES.

A few words will suffice for all that I have to say regarding the diagnostic uses of the curette. The instrument may be passed into the interior of the uterus, and a fragment of the tissue removed and examined microscopically. In this way the distinction may be made, or confirmed, between endometritis, carcinoma, myoma, and possibly also sarcoma of the uterine body.

During recent years the justifiability of curetting in order to diagnose extra-uterine pregnancy has been called in question. What practice one follows in this matter depends entirely upon what one does with the passage of the sound in like circumstances. If the one instrument may be used, so may the other. J. C. Webster,[1] however, has shown that whilst the presence of decidual tissue is sufficient along with other signs to establish a diagnosis, its absence does not exclude ectopic pregnancy, for the mucosa may have been previously expelled.

DANGERS.

That the use of the uterine curette is accompanied by several dangers cannot be gainsaid; but that with care, and above all with antiseptic precautions, these dangers can be enormously diminished is also undoubted. Further, certain of the risks are certainly as much due to the dilatation and to the intra-uterine cauterisation and douching which accompany the curettage as to the use of the curette itself. Again, in certain cases of uterine perforation ascribed to curettage it would seem that the real cause was the *forceps* introduced to remove fragments of tissue. Whilst we must not minimise the risks of curetting, we must not at the same time exaggerate them. What the dangers really are may be shortly enumerated.

[1] Webster (J. C.), *Ectopic Pregnancy*, p. 195, 1895.

1. *Abortion.*—That the curette will, just like the uterine sound, be occasionally unwittingly introduced into the pregnant uterus by mistake must be admitted. A careful inquiry into the menstrual history, combined with a thorough bimanual examination prior to curetting, will usually prevent the occurrence of this accident. It may be said that in certain cases there is a red discharge from the uterus which prevents the patient's history giving us the clue. This is true, but in such instances the discharge probably points to a very abnormal state of intra-uterine affairs.

2. *Sepsis.*—Sepsis used to be a not infrequent result of curetting in the days when the operation was preceded by slow dilatation accomplished by a sponge tent,[1] when the procedure itself was carried out in the consulting-room and dispensary, and when the need for the strictest antisepsis was not recognised. By regarding curettage as an operation requiring as great care as any other in gynecology, by preparing the patient before curetting, and by seeing that every antiseptic precaution is taken during it, we can render septic infection from it almost unheard of. In the hands of good operators it must now be a very rare accident.

3. Among the rarer dangers of curettage is the *obliteration of the cavity of the uterus* thereafter. An extraordinary case of this kind is reported by Fritsch (125), in which, in a puerperal patient of 25 years, curettage for hæmorrhage was followed by a period of two years during which no menstrual flow occurred. At the end of this time an infantile uterus was discovered without the slightest trace of a cavity. Veit (157) reports a similar case in 1895 after an abortion, and Otto Küstner (145) one of partial uterine obliteration. It would appear that too energetic curettage in a puerperal uterus may set up or exaggerate the process of involution so as to bring about superinvolution with disappearance of the cavity in the viscus. It will, therefore, be well to deal lightly with the post-partum or post-abortum organ. At the same time the risk cannot be great, for the number of recorded cases is exceedingly small.

4. *Rupture of purulent collections in the pelvis* is a real danger in curetting, and it is for this reason that many would still forbid the operation when there is tubal or peritoneal mischief. At the same time the risk has, I think, been exaggerated, and with *chronic* annexial inflammations there is not much risk. Of course when there is known to be a pyosalpinx the question of curettage, done even in the most careful fashion and by the most reliable of operators, must be a matter for very grave investigation. It must be remembered that under the circumstances we are choosing between laparotomy, vaginal removal of the suppurating append-

[1] F. Barnes (130) at the present time uses the laminaria tent, and holds that "it is itself aseptic, and even antiseptic, by reason of the chlorides, bromides, and iodides with which it is impregnated by the sea water in which it grew."

ages, and curetting, and that should rupture occur during the last-named procedure we must be ready to do one of the others.

5. *Perforation of the uterine wall.*—Without agreeing with those who regard perforation of the uterus with the curette as a necessarily fatal accident, it is well not to go to the opposite extreme of thinking it a harmless incident. That this traumatism occasionally occurs is not to be wondered at when one remembers the enormous number of curettings that are now done, and the likelihood that in some of the cases there will be a uterus with a wall that is unusually friable or abnormally thin. It is said to be common in the puerperal uterus. In estimating the danger of perforation it ought to be borne in mind that in several of the cases of curetting in which this accident is reported, *e.g.*, those of Alberti (119), Veit, Gusserow, Orthmann, and Martin, forceps were introduced into the uterus, and by their means the herniation of the intestine which was present was produced. The fact has been specially pointed out by Dupluy; and Auvard (120) has insisted that perforation is not due to the curette, but to the preliminary use of separable metal dilators. Probably the passage of the curette through the uterine wall is not in itself likely to give rise to much harm unless either it or the wall is septic; but the passage of fluid from the uterus into the peritoneal cavity may give rise to serious symptoms, and of course if a loop of intestine be dragged into the uterine cavity grave results will undoubtedly follow. Sometimes perforation is only apparent, as in the cases where the uterine muscle suddenly passes from a state of contraction into one of relaxation; then the sensation given to the hand is very similar to that when the curette perforates the wall. Should grave symptoms follow a perforation one must be prepared to perform laparotomy; but, as I have already said, one ought not to embark upon a curetting without being prepared to follow it up with an abdominal section if necessity requires it. Usually, however, the packing of the uterus with iodoform gauze the moment the puncture is detected will prevent any mischief arising.

6. *Hæmorrhage.*—The danger of hæmorrhage during, or after, curetting is not great, and if it does occur it is not difficult, by packing, to apply sufficient pressure soon to stop it. Of course this is presupposing that curetting has been performed for one of its legitimate indications.

TECHNIQUE.

Preliminaries.—Too great care cannot be taken of all the preparatory arrangements in cases of curetting, and success will reward him who is most particular in these matters.

If it be possible to choose a time, the week following menstruation ought to be fixed upon, and I usually curette the day after the flow has ceased, in order to give the uterine mucosa the longest possible period to revive before the irritation of the next menstrual

epoch comes on. The cases in which curettage is employed for post-abortum hæmorrhage and sepsis and for post-partum septicæmia do not come under the action of this rule.

The patient ought to be kept in bed for the day before the operation; the urine should be carefully tested; and some form of opening medicine should be given, followed by an enema on the morning of the day of curetting. The vaginal canal should be douched on the evening preceding the operation, and also in the morning, and special attention should be paid to the thorough cleansing of the mons veneris and external genitals.

The Armamentarium.—The instruments employed will vary with the individual tastes and requirements of the operator; the following are those which I usually provide:—A vaginal speculum (Marion Sims', or a modification thereof, *e.g.* Auvard's retaining speculum), and one or two copper retractors; two or more strong-toothed volsellæ provided with clips; a set of uterine dilators, preferably Hegar's cones or Auvard's new hollow metal rods; sharp and irrigating curettes, preferably Récamier's double scoop, Thomas's spoon-saw, and Rheinstaedter's flushing curette (curetting forceps and the blunt curette I never use); a set of three or four uterine sounds, or Playfair's probes armed with cotton wool; a male catheter, No. 10; an intra-uterine douche of an approved pattern; a pair of curved packing forceps; and a sufficient number of pledgets of gauze (instead of sponges), and a long strip of iodoform gauze for packing the uterus, and another for the vagina. There ought also to be ready at hand a bottle of iodised phenol for cauterising the interior of the uterus, an anæsthetic, and antiseptic solutions (*e.g.*, perchloride of mercury, 1 in 5000). Where it is possible, the instruments ought to be of metal, and should be previously boiled for fifteen minutes in soda solution (1 to 3 per cent.).

Operator and his Assistants.—The operator ought to take the same personal precautions that he would in cases of abdominal section or hysterectomy. This is, I believe, a very important matter, especially in the cases in which curettage is performed, notwithstanding the existence of acute or chronic tubal or perimetric conditions. He ought, therefore, to be rigorously careful with regard to the thorough cleansing of his hands, and should wear a waterproof apron and sleeves. His assistant and the nurse ought to be equally careful.

The Operation.—The patient having been chloroformed, ought to be placed in the lithotomy (dorsal) posture rather than in the left lateral, on a table, and not in bed, facing a good light. The field of operation should be protected with sterilized towels, and the hips should be raised by and rest upon a pad of antiseptic cotton covered by mackintosh. The patient may be held in position by assistants, or in default one of the many "crutches" may be used.

Before proceeding to the actual operation fifteen minutes should be definitely set aside for the thorough cleansing and disinfecting of the external genitals and vagina. The hair ought preferably to be shaven off, and the parts, both vulvar and vaginal, are to be thoroughly scrubbed with soap and water, and thereafter washed with perchloride solution (1 in 4000). Too much care cannot be taken to ensure the intra-vaginal cleansing, and pledgets of gauze (instead of sponges) in sponge-holders may be used to scrub the walls, the fornices, and cervix. The urine should be drawn off before the operation begins.

The Sims' speculum is passed, and held in position by the assistant or nurse; then the operator lays hold of the cervix with two volsellæ, one grasping the anterior, the other the posterior lip. The use of two volsellæ distributes the traction upon the cervix better, and minimises the risk of laceration of the tissues. The uterus is then to be dragged gently downwards till the cervix is well within the range of sight and touch. Where the uterus is fixed this cannot, of course, be done, and ought not to be attempted; the cervix should then simply be fixed, and the speculum so adjusted as to give the best possible view of the parts without downward displacement. We should never attempt to introduce the curette without seeing the orifice of the cervical canal into which we are causing it to enter.

By means of a careful bimanual examination ascertain as accurately as possible the exact position and inclination of the uterus, so as to know the direction in which the dilators and curette are to be inserted. Then, having fixed the cervix, begin the dilatation. Of course, in post-partum cases this part of the process will very probably be unnecessary. Introduce first one of the smallest sizes of the Hegar dilators, which has been warmed and covered with carbolized vaseline. Begin, in most instances, with a No. 3 or 4, and let it pass in without the use of force, making sure always that it is being passed in the right direction. Leave it *in situ* whilst the next (larger) size is being warmed and greased, then withdraw it and introduce No. 5, and so on till No. 13 or 14 passes in easily. I have entirely given up the use of metal dilators with separate blades, for I regard them as unavoidably dangerous. The traction exercised upon the anterior and posterior lips of the cervix during dilatation should be made equal, and care should be taken that the teeth of the volsellæ do not protrude into the cervical canal. The rate of progress of the dilatation will vary in different cases according to the amount of resistance offered by the cervical tissues; but from fifteen to twenty minutes ought not to be too long to allow for the completion of this part of the operation.

The canal being now sufficiently open, it is well to dip the forefinger in an antiseptic solution and introduce it into the uterus before we pass in the curette. This is an important precautionary measure; if anything is felt in the interior of the uterus it may

thus be removed by the finger alone. The curette must then be introduced; it ought to be applied in a systematic fashion, first to the anterior, then to the posterior, and then to the lateral walls of the uterus; finally, the fundus and the upper uterine angles should be scraped. The instrument should be guided in these manipulations by the operator's left hand placed on the patient's abdomen. After each scraping—which is, by the way, accompanied by a creaking or crackling sound, "le cri utérin"—we should withdraw the curette and wash off its contents for future microscopic examination into a cup of water placed near at hand. In the next place, the uterine cavity should be flushed out either with an ordinary intra-uterine douche or with a flushing curette. Then iodised phenol is to be applied to the interior of the uterus on armed sounds or probes, care being taken to protect the vaginal walls during the process. By means of a pair of curved dressing forceps, firmly pack the uterine cavity with a strip of iodoform gauze about two or three feet long and one inch wide. Put a plug of the same gauze in the vaginal canal, and a pad of antiseptic absorbent wool over the vulva, and keep the whole in position with a bandage. The patient is then put back to bed and treated as after any similar operation.

Of course, the operative details will differ slightly with the condition which has constituted the indication; but the line of conduct laid down above is that which will be found most generally useful. Of the technique in some of the rarest indications I have not thought it necessary to speak.

After-treatment.—After the operation the patient is to be kept at rest. The urine may require to be drawn off the same evening; but often this is quite unnecessary. The plug is usually removed on the third or fourth day (and with it the intra-uterine strip of gauze is taken away), and a smaller one put in its place; but in the instances in which curettage has been performed for suppurative conditions the gauze may require to be changed within twelve hours, and twice daily thereafter until it comes away dry. This latter statement applies especially to the post-abortum and post-partum cases. Douching is indicated after the removal of the plug. The patient should keep her bed for a week or for ten to fourteen days in the more serious cases. She ought to rest at the next menstrual epoch, as the flow may then be excessive. When the uterus has been curetted as a measure preliminary to another operation, then the second operation may be proceeded with at once, or not till four or five days later.

Marital relations ought not to be resumed till eight weeks after the curetting. In this way conception, if it occur, is more likely to lead to a successful gestation. At the same time cases are on record in which impregnation has occurred within a month of the operation. Bossi (132) has found that the new uterine mucosa can grow a decidua twenty-five days after curettage; but it does

not at all follow that the decidua thus formed will be satisfactory.

If curettage be carried out in the way above indicated, and especially if rigorous antiseptic precautions be taken during the operation and uterine drainage maintained after it, the risk will be reduced to a minimum, and the chances of complete success in properly chosen cases will be largely increased.

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The discussion on this paper was postponed.

MEETING IV.—JANUARY 29.

(*Extra Meeting held at Surgeons' Hall*).

Prof. SIMPSON, *Vice-President, in the Chair.*

I. *Dr Struthers Stewart* showed some Views, illustrating ENDOMETRIC CONDITIONS, by means of the Electric-arc Lantern.

II. *Dr Berry Hart* showed Microscopic Sections of EPITHELIOMA VULVÆ, FIBROMA VULVÆ, AND FIBROMA VAGINÆ.

III. ON THE USE OF PLASTER MOULDS AS A BASIS FOR MODELS IN GYNÆCOLOGY AND OBSTETRICS.

By D. BERRY HART, M.D., F.R.C.P. Ed.

FOR some time past I have been in the habit of taking moulds of the perineal region prior to operation, and have also taken them, apart from operation, in the abdominal and sacral regions in obstetric cases.

The casts of these in Cathcart's mixture have proved to be of value, not only in settling several disputed points, but also in enabling me to have models made illustrative of the various stages in perineal and cervical operations,—stages most difficult, if not quite impossible, to demonstrate to the student by diagrams. These models can also be photographed, and used as a basis for drawings.

I therefore purpose bringing before you to-night the methods I have employed, and the various casts and models obtained, remarking at the same time on some of the views and suggestions they give.

I shall take up therefore—(1.) METHODS. (2.) USE IN OBSTETRICS. (3.) USE IN GYNÆCOLOGY.

(1.) THE METHOD.—This is quite simple, and I can best illustrate it by giving as an example what is done in a case where one has to operate in a perineal tear involving the anus. The patient being in the lithotomy posture, the parts are cleansed and shaved as usual, and the ordinary antiseptic precautions taken. Several sheets of strong paper are then taken, and so applied between the sacrum and operating table and to the outer aspects of the thighs as to form a space into which plaster can be poured. It must be seen that the apposition is such as to allow of no leakage. Plaster is then prepared, poured into the space, and allowed to set. This takes place in a few minutes. The plaster must not be too thin, and should be made with water slightly warmed. It is then removed, the parts cleansed, and the operation gone on with.

From this mould a cast in Cathcart's mixture should be taken. This gives all the delicate lines in the plaster mould. For the various models we require duplicates in plaster, as on them lines of incision can be traced, and deep grooves can be made into which flaps of denoline can be inserted. This was done for me by Dr Fothergill of Manchester, whose account of the plan he found best is as follows:—

"The first cast was got in plaster directly from the original mould, the process involving the destruction of the mould. In order to get further casts a gelatine mould was made from each original cast, and from the gelatine mould copy after copy was taken in plaster, without injury to the mould. Having got the plaster casts, they were allowed to dry thoroughly, and were then finished with sandpaper, and covered with a few coats of a drying oil, such as boiled linseed. Ordinary oil paint was then used for colouring. To get a dead surface it was only necessary to mix turpentine with the paint, any degree of shine being obtained by a similar admixture of varnish.

"When it was desired to show the stages of a plastic operation, the work was done before painting. The parts of the cast to be operated on were cut clean out with knife and chisel, and replaced with a plastic mass of denoline mixed with water. Taking a wet knife, the incisions were then made in the denoline, and the flaps

raised and adjusted exactly as if operating on a patient. During the next few days, as the denoline was gradually drying and hardening, it could be cut, bent, and modelled with great ease. Finally, when quite dry, the surfaces of the denoline and the plaster next it were finished with sandpaper, and rendered ready for oil paint by a few coats of drying oil as before. The colour lies as well on the denoline as on the plaster, so that after painting it was impossible to distinguish between them. In doing this kind of work it is difficult to get a plastic material which will dry firm and strong. Sculptor's clay crumbles when dry if mixed with water, and if mixed with glycerine, will never dry. If mixed with a drying oil it lacks coherence after being kept for some time. Putty also, if made into thin flaps, lacks strength. Denoline, however, a patented plastic material, made by an Edinburgh firm, and sold by artists' colourmen for decorating picture frames, etc., exactly fulfils our requirements. It can be mixed to any consistence, and will adhere to any substance that is not greasy. By cutting a few grooves in a plaster surface it can be dovetailed into them, so as to make one mass with the plaster when dry. By mixing a few fibres of cotton wool with the wet denoline, additional strength can be given to it when very thin flaps of it are wanted. When dry it is like hard wood without any grain, and can be cut, sandpapered, and polished in almost any way. We can therefore recommend it strongly as a material for medical or scientific models."

(2.) Use in Obstetrics.—I have here employed it in as yet only three instances. In the first place I took casts of the external abdominal surfaces at the end of the first stage, at the beginning of the third stage, and at the end of it. These are chiefly useful for class purposes, and show very well the great changes that take place in the abdominal contour at the various stages of labour. The second example of its use was in regard to the sacro-lumbar surface or lozenge boundary, known as the Raute of Michælis. This area is of importance, as enabling one to determine the posterior boundary for Baudelocque's diameter. In class lectures one can easily demonstrate this point on the bony pelvis, but this does not give the student what he needs—a demonstration of what he is to look for clinically. The cast enables one to do this. It is taken very easily, shows the boundaries of this space very well, and helps further in diagnosis. As is well known, the upper angle of this lozenge is greater in the rachitic pelvis than in the normal, and must vary very much in the spondylolisthetic form. The model also enables one to verify Schroeder's rule for ascertaining the posterior point clinically, and helps class-demonstration greatly. In a recent paper Stratz gives an interesting account of it, in its artistic and obstetric relations. The paper is well illustrated, and draws attention to some points neglected in this country. In the third place, I obtained a valuable mould of the perineal region in an old primipara while the head was passing, or, to use an old

phrase, "crowning." The cast gives a very good idea of the distension, and affords an important series of measurements. Combined with the photographs I have already obtained in other cases, it enables one to give a more thorough description of the very last portion of the second stage than has hitherto been given in our ordinary text-books.

The measurements are as follows:—From centre of anus to anterior margin of perineum, 16 cms. The part of the head exposed measured 7·5 cms. by 4·7 cms. This gives, therefore, the diameters of the vulvar cleft at this stage. The perineal bulge is very well marked, and should be compared with the cast of the virgin genitals to be presently described. A photograph of another case, taken some time before, shows the frontal suture mesial in the cleft. I think that in rigid perineum cases in hospital, similar moulds might be taken with advantage.

(3.) USE IN GYNÆCOLOGY.—I have employed this method most frequently in Gynæcology, for evident reasons. The following are the main cases in which it was done:—

External Genitals.—It is remarkable, considering how easily the observation can be carried out on the genitals, that the usual descriptions are so inaccurate. Recently Cullingworth has shown that the edges of the hymen are in apposition so as to form a vertical slit, with pouting edges. The fact is, that in observing such relations, one does not usually allow for the disturbance of the examining fingers. The casts I have taken have the great advantage of disturbing the relations as little as possible, the only thing requiring to be allowed for being the disturbance and separation of the labia majora by the lithotomy posture.

When so examined, we then find that the fourchette is really a loop of skin continuous with the labia minora, and with the inner edges of the loop in contact. Another point it shows clearly is, that the genitals do not lie on a flat surface, as an ordinary drawing represents them, but that their outline is the arc of a circle.

Models of the various stages in the operation for tear of the anus, for prolapsus uteri, and amputation of the cervix.—I need not give any detailed description of these models. It is impossible to give the student an accurate idea of these operations from diagrams, but the models make the stages evident, and can be studied by the learner at his leisure.

I have also taken casts of the parts with the speculum *in situ*, and used these as a basis for the stages of hysterectomies. All the models are not, however, ready yet.

These methods seem to me well worthy of attention from teachers, as they aid in demonstration immensely.

Prof. Simpson (Vice-President) expressed the thanks of the Society to Dr Hart for the great treat he had afforded the Fellows in the very interesting and suggestive demonstrations with which

he had favoured them. It must have cost him a large expenditure of time and thought to prepare the casts and slides and provide for the beautiful lantern exhibition; and his clear exposition of the various objects had made them feel that the meeting had been not only profitable but extremely pleasant. Teaching by means of plaster moulds might not be original, but at least Dr Hart had shown its application in some new directions, and they could understand his success as a teacher when they saw the ingenuity which had enabled him to demonstrate what it is so difficult intelligibly to describe, the stages and the technique of a perineoplastic operation.

IV. A PRELIMINARY NOTE ON THE DEVELOPMENT OF THE CLITORIS, VAGINA, AND HYMEN.[1]

By D. Berry Hart, M.D., F.R.C.P.E., Lecturer on Midwifery and Diseases of Women, School of Medicine of the Royal Colleges (Surgeons' Hall), Edinburgh.

While much has been done to put the development of the female genital organs on a satisfactory basis, there are certain points in which our knowledge is defective, as well as some outstanding facts which have not yet received a clear explanation, and can thus only be classed as anomalous. In the first place, so far as our present knowledge goes, it is remarkable that in the fœtus at full time a hymen is always present; and still more remarkable that even in atresia vaginæ the hymen, and occasionally a double hymen, is developed. Why should the hymen be always present in the full-time fœtus? Why in atresia vaginæ should the hymen escape the atresia?

Then, again, the structure of the vaginal mucous membrane is quite analogous to that of skin. We have many layers of a squamous and quite characteristic nature, the cells of the deeper layers being more oval and staining more deeply. The superficial layers desquamate like skin; there are practically no glands present, and in prolapsus uteri the everted mucous membrane takes on the appearance of the body skin. One would expect, therefore, an epiblastic origin for the lining of the vagina and the outer covering of the vaginal cervix. The genital tract is stated to be developed, however, from the ducts of Müller, the non-coalescing parts forming the Fallopian tubes, the coalescing portions the uterus and vagina. The ducts of Müller arise probably from the mesoblast, the Wolffian ducts from the epiblast. The received opinion is, therefore, that the vaginal lining is derived from Müller's ducts, a mesoblastic source, and that the Wolffian ducts and bodies have only an important excretory function in the early fœtus until the permanent kidneys develope. Their importance as active organs then ceases,

[1] From the Laboratory of the Royal College of Physicians, Edinburgh.

and they are considered as possessing merely a pathological significance, as they provide the gynæcologist with the well-known parovarian cyst, with some of the papillomatous tumours of the ovary and broad ligament, as well as some of the rarer vaginal and broad ligament cysts. Some observers assert that the Wolffian ducts enter into the formation of the lower part of the vagina; and Pozzi, in a very acute and able manner, gives most excellent reasons for considering the hymen as not vaginal. Whether he is right in stating that it is to be considered vulvar remains to be seen.

For some time past I have had prepared for microscopical examination the pelves of early fœtuses, male and female, the paraffin method being employed and the material cut serially. I examined them at first for my own information and for teaching purposes, but the remarkable developmental changes roused my interest and induced me to go more thoroughly into the matter than I had at first intended. From the published works and papers of His, Waldeyer, Dohrn, Nagel, v. Mihalkovics, Budin, Tourneux and Legay, Klein, Pozzi, Kollmann, Keibel, and from the suggestive text-book of Minot, I received much valuable information, but no answer to the initial difficulties I have stated. A prolonged and careful examination of my specimens seems to me to have cleared up these anomalous points, and this is my reason for publishing the present communication, and committing what the professed embryologist may consider a trespass.

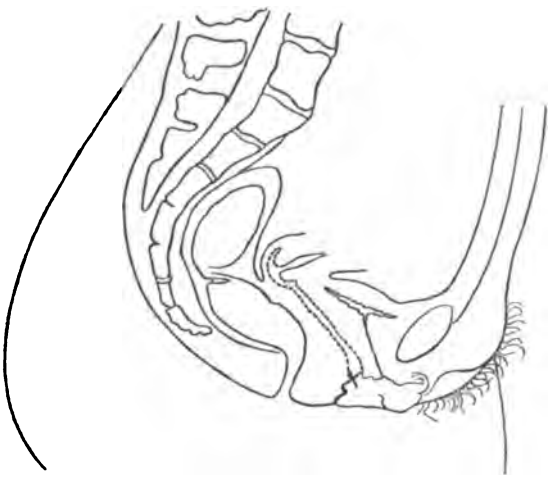

FIG. 1.—Vertical mesial section of the female pelvis (modified from Foster). A cross marks the site of the hymen, and the lining of the vagina derived from the Wolffian bulbs has a dotted outline.

The question to be considered will be clearly understood if Figs. 1 and 2 be first studied. Fig. 1 shows a vertical mesial

section of an adult pelvis. One sees the hymen on section, and the vagina with its outline dotted where its lining is derived, as I hope to show, from the Wolffian ducts, and therefore epiblastic.

Farre and Cullingworth accurately describe the hymen as a pouting vertical slit, and there is no doubt that some of its various shapes are made by the method of examination.

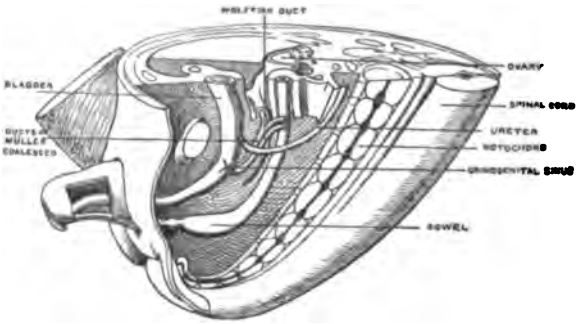

FIG. 2.—From Keibel's model of organs in fœtus at about eighth week. The eminence of Müller where the hymen will develope is marked with a cross, which also lies at the upper end of the sinus. (8.)

Fig. 2 shows Keibel's valuable model of the relations at the eighth week; it is practically the same as in the seven weeks' fœtus, of which sections are given in the Plates. It is at Müller's eminence that the hymen is developed, and the main object of this note is to determine some of the changes transforming Fig. 2 into Fig. 1.

The specimens I had for examination were as follows:—(1.) Serial sections of a five weeks' fœtus, carefully prepared and stained, which I owe to the kindness of Dr H. J. Stiles. (2.) A seven weeks' fœtus, also serially cut. This was from a cancerous seven weeks' pregnant uterus, successfully extirpated by me, and prepared and stained by Dr Lovell Gulland. (3.) A fœtus at the third month, perfectly fresh and well preserved. (4.) A four and a half months' fœtus, and (5.) one at full time. I also examined several male pelves as well as those of fœtal rabbits, but do not consider these at present.

The fœtuses (3.) to (5.) were prepared by Mr Hume Patterson at the Laboratory of the Royal College of Physicians, where also the microphotographs and transparencies were made. I am greatly indebted to Mr Patterson for the skill he displayed in the preparation of the specimens and photographs.

The early fœtuses were cut serially and transversely by the paraffin method; all the sections were mounted. The later fœtuses were treated in the same way, but only every sixth could be mounted, and the sections were cut in the sagittal mesial plane.

Mr Stiles' preparation had been stained in carmine in block; for all the rest, logwood and eosin were employed.

Based on this examination, and on the literature of the subject, I shall now consider—

(1.) *The development of the genital tract prior to the formation of the hymen.* This is well illustrated by the fœtuses of the sixth and seventh week.

(2.) *The origin and development* (a) *of the prepuce of the clitoris, and* (b) *of the hymen.* The fœtuses of the third and fourth month illustrate this stage.

(1.) *The development of the genital tract prior to the formation of the hymen.*

In the seven weeks' fœtus one finds, in the abdominal cavity, the peritoneal ridges, one on each side of the middle line, with the Wolffian bodies. Lower down, the outer ridges with the Wolffian and Müllerian ducts appear; and at the lower levels, the ovary with its characteristic pedunculated form comes into view, lying on what will be the posterior lamina of the future broad ligament. The Wolffian bodies have greatly lessened in size, and at the level of the ovary are much diminished in section. The outer ridge is hour-glass shaped on transverse section. In the outer segment the ducts of Wolff and Müller develope: the inner one becomes the ovary. The outer joins its fellow to form the broad ligament in front of the ovarian part, which thus comes to lie behind.

In the broad ligament we have the Wolffian ducts and ducts of Müller, and at a lower level the genital cord of Thiersch. In the five weeks' fœtus we find four canals in the genital cord, the two outer being the Wolffian ducts, the two inner the ducts of Müller. In the six weeks' fœtus the ducts of Müller have coalesced into one canal, but the Wolffian ducts are distinct. Still lower we get the Wolffian ducts opening into the urino-genital sinus, while the ducts of Müller end in the eminence of Müller between these (*v.* Plates I. and III.).

Immediately before the Wolffian ducts so end they flatten out laterally, and with the Müllerian ducts form an H-shaped appearance on transverse section (Pl. III., Fig. 6). So far, then, it is certain that the Anlage of the greater part of the vagina is the ducts of Müller, with probably a part of the Wolffian ducts where the adult vagina is H-shaped on transverse section. (Hoffmann, quoted by Pozzi; but I have not been able to get the original paper.)

(2.) *The origin of* (a) *the prepuce of the clitoris and of* (b) *the hymen.*

In the four and a half months' fœtus the coronal section of the glans clitoridis shows a remarkable horse-shoe like structure surrounding the glans tissue. The margins of the horse-shoe consist of a layer of active cells staining deeply, while between

these we have less deeply stained cells (Pl. IV., Figs. 7 and 8). So far as one can determine, they are epithelial cells. Their origin and nature are clearly determined in the sagittal sections of the glans in the three and a half months' fœtus, where one sees, at the lower part of the clitoris apex, the epidermis sending in two sickle-shaped processes whose apices do not meet (Pl. IV., Fig. 7). This is really a thimble-like involution of epidermis, the open base of the thimble being at the corona. The superficial layers of the epidermis are necessarily in the centre of these involutions. The clitoris in the early fœtus is bulbous and entire (Pl. V., Fig. 10). The involution, as already described, takes place at or about the third month, and the separability of the prepuce is formed by the central cells, which are really the superficial ones, desquamating; *i.e.*, the prepuce is now the movable hood we find in the adult.

To see the changes which bring about (b) *the development of the hymen*, we must examine sections at the third and fourth month respectively.

The specimens I examined were at the third and a half and fourth month, and the sections were cut sagittally in the former specimen, and in the axial transverse direction in the latter; *i.e.*, from side to side, and in the axis of the brim in the four and a half months' one.

Remarkable changes have taken place in the vagina. We have seen that in the early fœtus the vagina was formed from the coalesced ducts of Müller, and that a lumen was present, the cavity being lined with a single layer of cells. What we now find is as follows:—At what we may term the site of the vaginal entrance one sees an ingrowth, the deeper layer of the vestibule lining passing in, and with it the superficial layers too. This passing in of the superficial layer is, as in the case of the clitoric prepuce, of great importance, as it is the desquamation of these superficial layers, however effected, that gives rise to a lumen. The passage is in the form of multiple tubular ingrowths, so that we see on section several canals the walls of which gradually disappear, and thus a single canal up to the outer aspect of the hymen is formed (Pl. IV., Fig. 7).

A little higher in the vaginal axis remarkable structures are now to be noted, viz., two oval collections of cells from which cords of actively proliferating cells pass in several streams, as it were, to fill up the vaginal lumen as far as the cervix uteri, where in this specimen the posterior fornix is mapped out by a sickle-shaped prolongation of the cells. The vaginal lumen is solid below, but higher up a lumen has begun to form. The periphery of the bulbous collection of cells is mapped off by actively growing cells, while the mass of the bulb is made up of epithelial cells exactly similar to those of the epithelial lining of the fully developed vagina, the peripheric cells being the same as those in the deeper

layers of the vaginal epithelium. In regard to this bulb an examination of all the sections shows that the following conditions are present:—At a little distance from the middle line it is solid; in the middle line it has a lumen in the form of a vertical slit; while further out a second bulb is seen and with a duct, the Wolffian duct passing into it. One of the bulbs is the larger, and they lie laterally in relation to one another (Pl. VI., Fig. 12; and Pl. II., Figs. 3 and 4).

I may anticipate here, for convenience of terminology, one of the chief conclusions of my paper, by saying that these bulbs are Wolffian in their origin—*i.e.*, are derived from the Wolffian duct —and I shall now term them the Wolffian bulbs.

It is evident that we can now explain the hymeneal opening of the vagina, as we must distinguish between this and the formation of the fully developed hymen and its varieties. At present I only consider the former question.

The hymeneal opening is evidently formed by a vestibular involution from below meeting the bulbar distensions above, and causing a thinning, and ultimately a perforation, of the intervening tissue.

The four and a half months' pelvis shows the fully-formed and coalesced bulbs with a vertical slit, and according to the obliquity of the section we get either one bulb or both. Between the lower ends of the bulb is a vertical spur, the rudiment of the posterior vaginal column (Plate V., Fig. 9).

The full statement of the formation of the vagina and hymeneal opening seems to me to be as follows:—Up till the origin of the hymen the vagina is Müllerian and lacking its lower end. Then comes the formation of the Wolffian bulbs by a proliferation of the lower ends of the Wolffian ducts. The epithelium of these ducts, epiblastic in their origin, forms the Wolffian bulbs, and, proliferating, passes up into the vaginal canal, filling up its lumen, mapping out the fornices, covering the vaginal portion of the cervix, and passing at first into the lower part of the cervical canal. The central cells are the least active and become shed; that is, a lumen is formed. The vaginal entrance is formed where the epiblastic ingrowth from below meets the bulbar distension above, and this is the developmental definition of the hymen and the vaginal entrance.

The view so ably advocated by some authors, that the fully-formed vaginal lining is derived from the ducts of Müller, is full of difficulties. It would make the vaginal lining mesoblastic, and give no explanation of the remarkable blocking of the vagina with cells while the hymen is being formed, as well as no reason for the different lining of the adult vagina, uterus, and tubes. The lining of the uterus is Müllerian and mesoblastic, that of the vagina is Wolffian and epiblastic.

The question of the relation of these ducts to the germ layers is,

however, much disputed. In the Elasmobranchs they appear to have a common origin. So far as my reading and examination of specimens go, I am of opinion that the Müllerian duct is mesoblastic in the human fœtus, but that at its very lowest part the vagina is Wolffian and therefore epiblastic, and that as the hymen is derived from the Wolffian bulbs, its inner surface is epiblastic. Its outer surface is really hypoblastic, being derived from the lining of the urino-genital sinus.

The view I advance seems to me to explain the development so far as the points stated in the beginning of the paper are concerned, and may be summed up as follows:—

1. Before the hymen is developed—*i.e.*, up till the second and third month of fœtal life—the vagina is formed by the coalesced ducts of Müller, but no lower aperture and no hymen are present; the vagina is Müllerian and blind.

2. At the beginning of the third month two bulbs form from the lower ends of the Wolffian ducts, the periphery of these bulbs being formed from the more active cells, the central of cells of a more squamous type. The cells are, in fact, the same as those of the adult vagina.

3. By the proliferation and spread of these cells the Müllerian vagina has its lumen blocked, the fornices and vaginal portion of the cervix mapped out.

4. The Wolffian bulbs coalesce, break down in the centre, and as the Wolffian cells in the centre of the Müllerian vagina do the same, we get the normal vaginal lumen formed.

5. The hymeneal opening is brought about by the epithelial involution from below meeting the distending bulbs above.

6. The ducts of Müller determine the site of the vagina; the Wolffian ducts supply its lining and develope the hymen (*v.* also 5).

The bearing of these views on Atresia vaginæ is as follows:—

1. Atresia vaginæ is atresia of the Müllerian vagina, but the hymen, being Wolffian in origin, is present.

2. The reason a hymen is always present in the fully-formed fœtus is as follows:—The Wolffian bulbs form the hymen and obliterate the lower ends of the ducts of the Wolffian bodies, and as these are the temporary kidneys of the fœtus, they must of necessity have been present during the early life of a fully developed fœtus.

3. The double hymen is not due to a permanent duplicity of the ducts of Müller, but to a non-coalescence of the Wolffian bulbs. The vertical slit of the hymen is due to the apposition of the lateral Wolffian bulbs.

4. In imperforate hymen the tissue between the involution from below and the Wolffian bulbs has not been perforated.

The real essence of all this development seems to be as follows:—In the fully-formed genital tract we have the lining of the uterus developed from the ducts of Müller, and having as its

great function pregnancy and menstruation. Its single epithelial layer and delicate connective tissue fit it for these functions; but for the pressure of parturition which the vagina has to undergo, we need a multiple, squamous, in fact, skin-like structure, such as is supplied from an epidermic source. One can see the great difference in the mucous membranes of, say, an inverted uterus and prolapsus uteri. In the one we have a raw, bleeding surface, quite unfitted for friction; in the other a structure that soon becomes skin-like and horny. To give the vagina this skin-like structure we get the Müllerian lining replaced from the epiblastic Wolffian bulbs; these at the same time taking a part in the formation of the hymen, as already described.

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See Tourneux and Legay, and Hertwig's text-book for full literature.

DESCRIPTION OF PLATES.

Pl. I., Fig. 1.—T. S. of seven weeks' fœtus ; *a* is in Wolffian duct ; *c* points to summit of bladder. ($\frac{8}{1}$.)

Fig. 2.—T. S. at level where broad ligaments have formed. *a* is ovary ; *c* points to Wolffian relics ; *d* is Wolffian duct; *e*, duct of Müller. In both figures the spinal cord lies behind. ($\frac{8}{1}$.)

Pl. II., Fig. 3.—Shows Wolffian bulbs. The larger one shows the epithelium proliferating into the Müllerian vagina ; at the side is seen the second Wolffian bulb at its outer aspect, with the Wolffian duct passing into it. Wolffian duct has *b* in its lumen ; *a* is larger Wolffian bulb. ($\frac{200}{1}$.)

Fig. 4.—Wolffian duct and Müllerian vagina. Müllerian vagina, *a ;* Wolffian duct, *b*. ($\frac{200}{1}$.)

Pl. III., Fig. 5.—T. S. showing genital cord. *a* points to the three canals in it ; the central one is the coalesced Müllerian ducts ; the outer are the Wolffian ducts. *b* points to the eminence of Müller in the urino-genital sinus. It is at the eminence of Müller that the hymen forms. ($\frac{8}{1}$.)

Fig. 6.—T. S. shows genital cord as in fig. 5. In the urino-genital sinus the openings of the Wolffian ducts can be seen ; *a* points to genital cord ; *b* to urino-genital sinus. ($\frac{8}{1}$.)

Pl. IV., Fig. 7.—Sagittal mesial section of pelvis of three and a half months' female fœtus, showing development of hymen and formation of prepuce of clitoris. *e* is epidermis passing to map out glans ; *a* is on Wolffian bulb, which is breaking down centrally ; and *b* is involution from urino-genital sinus to meet distending Wolffian bulbs and make hymeneal opening. ($\frac{8}{1}$.)

Fig. 8.—Coronal section of four and a half months' fœtus to show passing of epidermis to form prepuce. *b*, glans clitoridis ; *a* points to active layer of epidermis. ($\frac{8}{1}$.)

Pl. V., Fig. 9.—Coronal section of pubic arch of four and a half months' fœtus between the layers of triangular ligament. *a* is lower end of urino-genital sinus ; *c* is at upper end ; *b* is the lateral half of the hymen developed from one of the Wolffian bulbs ; the section has missed the other half, but one can see the spur representing the posterior column of the vagina. *d* is on Bartholinian gland. ($\frac{8}{1}$.)

Fig. 10.—T. S. six weeks' fœtus (Stiles). Shows early clitoris and urino-genital sinus, *a*, *b*. ($\frac{8}{1}$.)

Pl. VI., Fig. 11.—T. S. seven weeks' fœtus showing cloaca. Rectum, *b ;* urino-genital sinus, *a*. ($\frac{8}{1}$.)

Fig. 12.—Vertical mesial section of three and a half months' fœtus. Wolffian bulbs, *a b ;* *c* is Müllerian vagina, with epithelial proliferation in it, and posterior fornix mapped out. Rectum, *d ;* symphysis, *e*. ($\frac{8}{1}$.)

PLATE I.

FIG. 1.

J. T. MURRAY, DEL.

FIG. 2.

DEVELOPMENT OF GENITAL TRACT.

PLATE II.

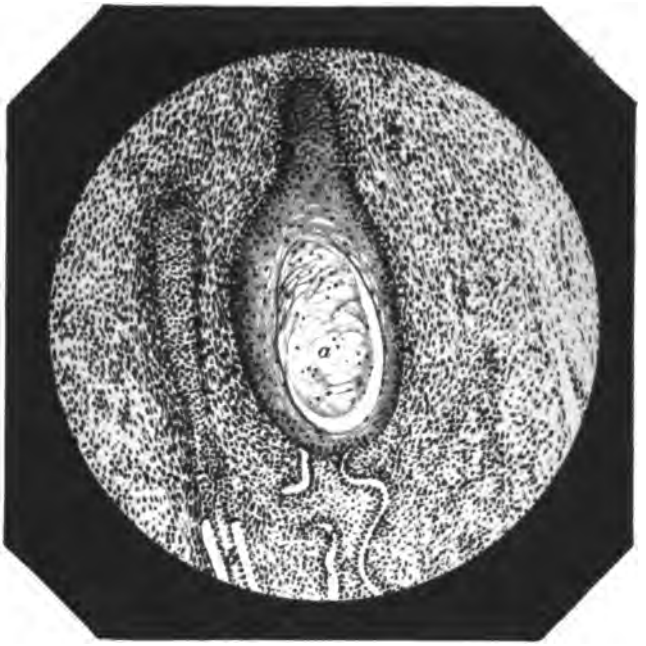


FIG 3.

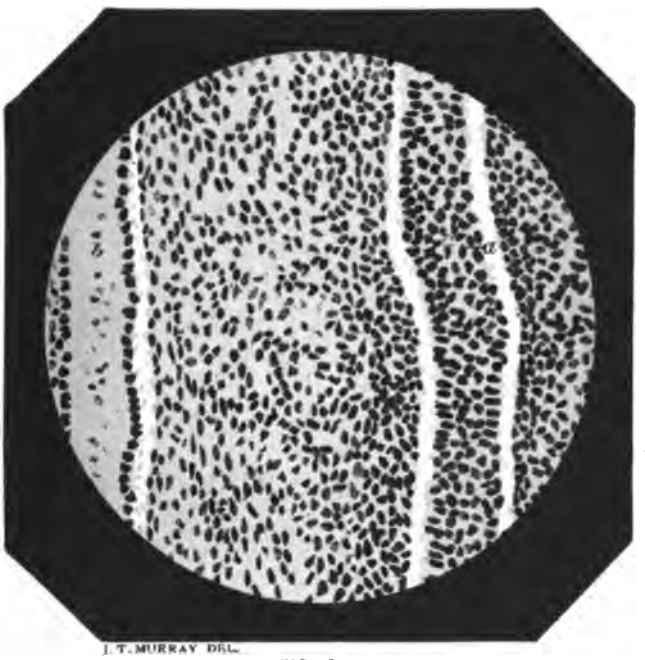
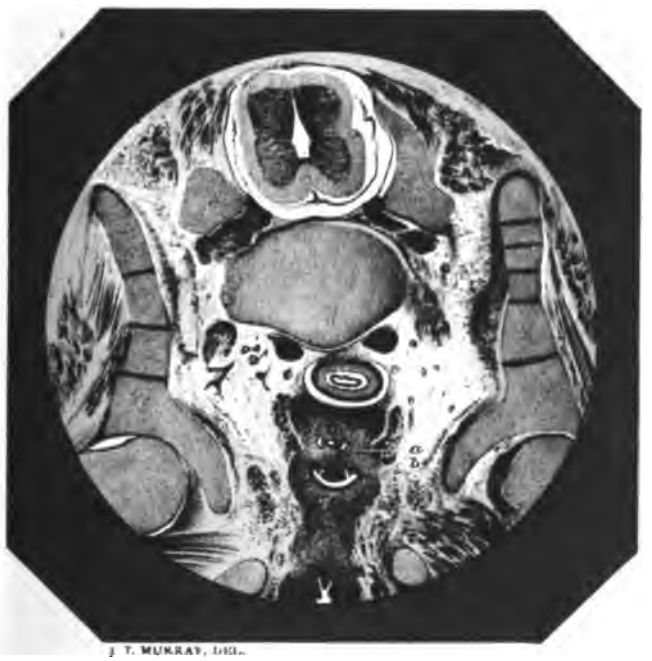


FIG. 4.

DEVELOPMENT OF GENITAL TRACT.

PLATE III.

FIG. 5.



J. T. MURRAY, DEL.

FIG. 6.

DEVELOPMENT OF GENITAL TRACT.

PLATE IV.

FIG. 7.

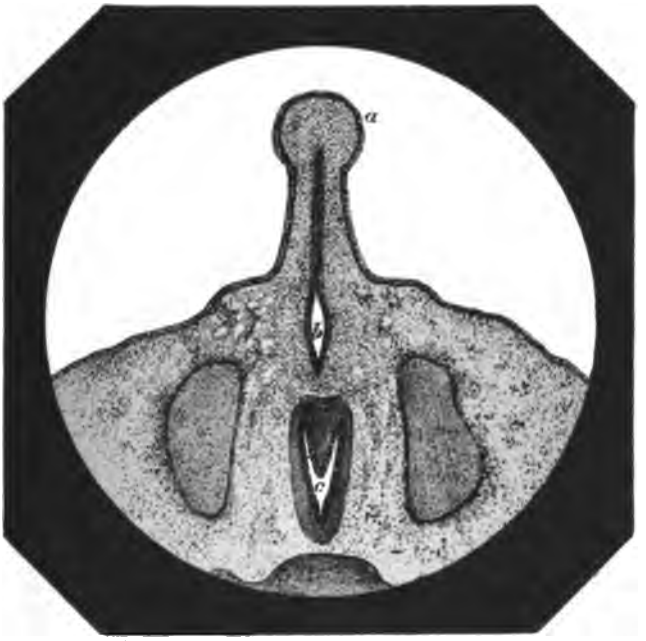
J. T. MURRAY, DEL.

FIG. 8.

DEVELOPMENT OF GENITAL TRACT.

PLATE V.

FIG. 9.



J. T. MURRAY, DEL.

FIG. 10.

DEVELOPMENT OF GENITAL TRACT.

PLATE VI.

FIG. 11.

J. T. MURRAY, DEL.

FIG. 12.

DEVELOPMENT OF GENITAL TRACT.

Prof. Simpson said that the embryological researches were of the deepest interest, and threw quite a new light on the development of the vagina and vulva. That Dr Hart had been absolutely correct in his interpretation of the changes he had described would, of course, need fuller confirmation by further examination of other embryos and fœtuses; but there was an air of verisimilitude in the demonstrations they had witnessed which must have made all feel that he was on the track of an important discovery. Dr Hart had found confirmation of his views in the presence of the hymen in cases where the vagina was completely atresic. He (the Chairman) would suggest that a study of the relations of the hymen in cases of duplicity of the vagina might give further important light on the subject.

Dr J. W. Ballantyne agreed with Prof. Simpson as to the special value and interest of the demonstration which Dr Hart had given. Even the best text-books on embryology gave a very uncertain sound on many of the points which Dr Hart had so clearly and ably demonstrated. As to the question whether or not the epiblastic Wolffian ducts and bulbs entered into the formation of the lining of the vagina and the hymen, he (Dr Ballantyne) felt that it was safe to leave it to the embryologists to thrash out; but whether or not there was agreement on this point, there could be no doubt that Dr Hart's theory formed a splendid working hypothesis to explain the mode of origin of some of the most puzzling anomalies and malformations of the external genital organs in the female. After all, this fact should go a long way in itself to support the theory, for it had over and over again been found that the study of malformations threw much light on normal development, and the theory which best explained the anomalous cases was probably also the most nearly correct as regarded the normal. Dr Hart's views were especially interesting in their bearing upon so-called imperforate hymen, and he (Dr Ballantyne) believed that most of the cases regarded and reported as hymeneal imperforation were really instances of imperforation of the lower ends of Müller's ducts, the hymen being present, but overlooked on account of the projecting Müllerian pouch. It would be of interest, and might prove or disprove Dr Hart's theory of origin of the vaginal lining membrane, if the nature of this epithelial lining in a purely Müllerian vagina could be microscopically determined. He thought also that this evening's demonstration might throw light upon the nature and mode of origin of vaginal and hymeneal cysts. There was to him one difficulty in regarding the Wolffian bulbs as the analogue of the hymen and vaginal lining — viz., the cases in which the Wolffian ducts were regarded as permanently present in the form of Gartner's ducts or Skene's tubules, and in which the hymen and vagina were yet normally formed. He had hoped that Dr Hart would have thrown some light upon the question of the primary

double character of the clitoris; he had recently met with a case of split clitoris and another of double penis, and had been much impressed with the idea that probably both these homologous organs were primarily double, but the embryological text-books gave no hint as to any such possibility. Yet in some of the lower animals—the reptilia and crocodilia for instance—the penis was either double or bifid; and it seemed to him as very probable that it would yet be found that in its earliest manifestations the sexually indifferent genital eminence might show signs of duplicity. In conclusion he thanked Dr Hart for his extremely profitable and suggestive demonstration.

Dr Berry Hart, in reply, thanked the Fellows for their kind and suggestive criticisms.

MEETING V.—FEBRUARY 12, 1896.

DR A. BALLANTYNE, *President, in the Chair.*

I. The following gentlemen were admitted Ordinary Fellows of the Society:—John Cumming, L.R.C.P. & S.E., 94 Gilmore Place, and S. J. Aarons, M.B. C.M., Australasian Club.

II. *Dr Haultain* showed a specimen of a MISSED ABORTION. The patient from whom the specimen was procured last menstruated in the first week of June. The symptoms of pregnancy were well marked till the middle of October, after which time the abdomen decreased in size and the breasts became flabby. She was seen in November and the condition then recognised, but interference was not advised. He again saw her in January, but as no inconvenience was complained of, he again refrained from interfering. On February 8 spontaneous expulsion of the fœtus in its amniotic sac occurred, but the placenta was retained. Its detachment was most difficult, and was associated with alarming hæmorrhage. The specimen on examination was of interest: it showed a four months' fœtus in its amniotic sac. The placenta was vascularized, but extremely fatty, and the fœtal surface was covered with dark tuberous masses, indicative of Deciduitis Polyposa. The case was clinically interesting, as at least supporting the expectant treatment of those cases where no active symptoms are present. Had artificial dilatation of the cervix for the emptying of the uterus been adopted, the separation of the adherent placenta would probably have been more difficult, and the blood loss correspondingly more severe. The specimen also demonstrated that although growth of the ovum ceased 4½ months before expulsion, the uterine attachment remained firm and vascularized, the condi-

tions being identical with those met with in the so-called carneous mole, the only difference being the fuller development of the ovum before cessation of growth took place.

III. *Dr Milne Murray* showed two MALE OSTEOMALACIC PELVES.

IV. OSTEOMALACIA: WITH A DISCUSSION OF ITS ÆTIOLOGY AND TREATMENT.

By JAMES RITCHIE, M.D., M.R.C.S. Eng., F.R.C.P., etc.

SOON after having commenced practice, a case of osteomalacia to which the writer was called made a very profound impression upon him, because although he had the benefit of Prof. Simpson's help, and everything was done which the then existing position of science suggested, the progress of the disease was of almost uninterrupted ingravescence, and it was a relief to all when the patient's hands were folded peacefully in death. The patient was an unmarried lady, aged 37. The symptoms were pain, distortions of bones, debility. The bony outlet of the pelvis with difficulty admitted the examining finger; for months there was copious menorrhagia. Since that time the writer has had four cases under his care, which he wishes to mention in relation to this disease. One, a case which he believes to have been osteomalacia in an early stage,—a woman about middle age, who suffered from pain in the sacrum and pelvis. She had also the rocking gait commonly seen in the disease, but she was not sufficiently long under observation to establish the diagnosis.

Another case he believed to be one of osteomalacia until after the post-mortem examination. This related to a married lady whom he attended for many years, and who had the right mamma removed by Prof. Annandale in 1885 for scirrhus. Her age was then 47. Recovery was rapid and apparently complete. Six years later she began to suffer from periodic attacks of pain in the spine and limbs, she decreased in stature, the pelvis became beaked, the thorax distorted, and about a week before death, which happened at the age of 56, there occurred, while the patient was being moved in bed, a fracture of the fourth rib on right side. At the post-mortem examination the pleuræ were found to be studded with small nodules of secondary cancer. The fractured rib, which was extremely thin, was seen on microscopical examination to be cancerous. The probability is, therefore, that the other bones were similarly affected, and that the case was not one of simple osteomalacia, but of osteomalacia carcinomatosa.

Of the other two cases, the first was a married woman, aged 55, who was much debilitated in consequence of a severe attack of pneumonia. The recovery was very tedious; she began to suffer from pains in the sacrum, spine, and ribs, and diminished considerably in stature. The urine was variable in character, with

frequent deposit of amorphous phosphates. This patient recovered slowly under the use of tonics.

The last case was a much more severe one, of long duration; but under Prof. Simpson's able surgical treatment is one of the triumphs of modern methods, and a strong contrast to the case first recorded.

Mrs F., aged 40, married seventeen years, has always been well cared for, and lived in comfortable circumstances. She was pregnant seven times; six children born at full term. About nine and a half years ago she had a miscarriage, soon after which she began to suffer pain in the left haunch, then in the sacrum. During her sixth pregnancy (the next one) the pain became worse, and she had difficulty in walking, but after confinement she recovered considerably. At her next pregnancy, the seventh and last, six years ago, there was a very marked exacerbation of all the unfavourable symptoms: pain in the sacrum and lumbar region, also at the points of emergence of the lateral branches of the intercostal nerves. The pains were aggravated by pressure. She had jerkings of the limbs, especially at night. There was increase of knee-jerk, specially on the left side; also ankle clonus on the right. The walking was feeble, the gait markedly rocking; the difficulty seemed mainly to arise from weakness of the flexors of the thigh. Sensation was normal.

The diagnosis then made was irritation of portions of the anterior horns of the spinal cord, probably due to reflex irritation from the uterus or its appendages. The delivery in June 1889 was by means of forceps; the recovery good, but slow; the walking power after a time much better than before the confinement, with less pain in the bones, but she never recovered the same amount of walking power as she had previous to the last pregnancy. In May 1891, so high an authority on nervous diseases as Prof. Sir Thomas Grainger Stewart, after careful examination, agreed that the case was one of spinal disease. From that time until 1895, the trouble progressed in a somewhat intermittent fashion; the patient drove often in a pony phaeton, and enjoyed best health when she was much out of doors. The pain in the spine extended to the dorsal region; this was entirely removed by the occasional use of Corrigan's button cautery. Various tonics were tried — strychnine, hypophosphites, and phosphorus in emulsion. Early in 1895, as she appeared to be losing in height, the pelvis was examined and found to be beaked, the angles of the scapulæ bent inwards. These changes rendered the diagnosis of osteomalacia evident. At Sir Thomas Grainger Stewart's recommendation, both white and red bone marrow were given, but without apparent benefit. During all this time the appetite was good, bowels regular, menstruation regular, and no exacerbations at the periods. The urine was often neutral or slightly alkaline, and frequently contained a white sediment which was not alto-

gether dissolved by weak nitric acid. The patient became slowly worse, was confined to bed, had the greatest difficulty in turning in bed, and for a time was liable to become faint on rising. Her height was formerly 5 feet, and just previous to operation 4 feet 8½ inches. As other methods had failed, Prof. Simpson was asked to see the patient with the view of having oöphorectomy performed. She was placed under his care, and he operated on 18th June 1895. The recovery was uninterrupted. A noteworthy feature was the rapid disappearance of pain. After ten days the patient was able to turn in bed, and on October 21 the writer received a note from her husband, in which he states that she is able to enjoy existence again after such a long (nine years') illness. "She walked fully two miles the other day, which is in great contrast with her helpless position a few months ago." On 11th February 1896 she stated that she was still improving in muscular power, and less easily tired than she had been for a very long time.

Symptomatology.—Before we discuss the etiology of this obscure disease, it is necessary that we should first recall a few facts regarding its history and course. In relation to it there has during the past ten years grown up a very extensive literature, especially in Germany and Italy, so that there are now at our disposal a large number of facts.

The existence of a disease characterized by softening of the bones has been recognised from early times. Reiske (*Opusc. med. ex monumentis Arabum*, p. 12), tells of an Arabian physician named Gschuzius who had no bones except in the head, neck, and hands. Gelpke gives other interesting references, among which he refers to Mahomet's celebrated soothsayer Gattib, who had no bones. Morand fils submitted to the Faculty of Medicine, Paris, in 1752, a full report of a Parisian woman, Supiot, who suffered from a disease characterized by softening of the bones. It was only about 1772 that osteomalacia was differentiated from rickets by Levacher de la Feutrie. In 1833 Lobstein, and afterwards Guérin, again endeavoured to establish the difference between these two diseases. Bouchard distinguished them completely, but even so recently as 1868 Trousseau contended that "they are one and the same. The differences between them belong to the difference between the conditions in which the economy has been surprised." He calls osteomalacia the rickets of adults.

It is probable that many of the earlier reports, perhaps some even of the later, include cases of other diseases, such as syphilis of bones, fragilitas ossium, secondary general carcinoma of the bones (osteomalacia carcinomatosa), and perhaps also some late cases of rickets.

The onset of the disease is usually obscure. The systems chiefly involved are the osseous and the nervous. Frequently cases, as Latzko points out, are mistaken for rheumatism, or for disease

of the spinal cord, having as symptoms paresis of the lower limbs, increase of knee-jerk, contracture of abductors, sometimes muscular spasms, ankle clonus, and general weakness of muscles. V. Braun believes that the diminished power of abducting the thighs is due, not to a contracture of the adductors, but to a want of power of the abductors in consequence of changes in the bones.

The earliest symptom is usually pain in the sacrum, pelvic bones, or spinal column, because the bones in these regions are usually first affected. The pain is more or less constant, aggravated by pressure and by movement. Then follows difficulty in walking, particularly difficulty in flexing the thighs on the trunk, which prevents the feet from being properly raised from the ground, and leads to an awkward rolling or waddling gait. As it advances the bones may bend, or they may be fractured. The bending of the bones is due to the removal of the earthy salts, and the changes in shape are governed by the ordinary laws of mechanics. The pelvis is usually first affected, and in consequence of the pressure through the spinal column on the sacrum above, and the resistance on the acetabula below, these three points are approximated, the shape of the pelvis tends to become triangular, the rami of the pubes more or less parallel, and it becomes beaked. Representations of characteristic deformities are seen in Plate I., Figs. 1 and 2. These are photographs of male pelves which Dr Milne Murray exhibited at the Obstetrical Society, and kindly placed at the disposal of the author. The form of pelvis is modified by the order and degree in which its component parts are softened. In a considerable proportion of cases the outlet is much diminished in size, the tuberosities of the ischium are not only approximated, but they are pressed backwards towards the coccyx, so that an examining finger enters the outlet with difficulty; but in Plate II. are photographs of a female pelvis from Prof. Simpson's museum, in which the outlet is not diminished in the ordinary way, the ischial tuberosities were displaced upwards and forwards in consequence of the folding upon itself of each os innominatum. In consequence of these distortions the origins and insertions of the muscles which act on the thighs are approximated, and their ability to act is therefore diminished. Next in order, the spinal column is affected; it is liable to become twisted in a variety of ways, the height of the patient is thereby diminished, and the thorax is deformed. The ribs also may be involved, in consequence of which further deformity of the chest results, its sides are forced in, sometimes hollowed by the weight of the arms, the sternum is thrown forward. The angles of the scapulæ become incurved. Later the long bones may be involved and distorted in a variety of ways. Allison (Newcastle) reports a very exceptional case in which the disease began in the bones of the right leg, later the left leg was involved; after ten years it spread to the

pelvis, and later to the other bones of the trunk. The bones of the cranium are very rarely affected. Trousseau, however, reports a severe case of the disease in which they were involved (*Clin. Med.*, New Syd. Soc., 1872, p. 86). As an evidence of the extent to which the distortion and also the flexibility of the bones may pass, the following extract from a letter from Ed. von Siebold to Kilian in 1856 is of interest:—"I—— had long been burning with desire to perform the Cæsarean section. At length he thought he had a suitable case—a woman afflicted with osteomalacia. He invited his colleagues (not me) to the operation, the deceased O—— with others. The woman already lay on the operating table, when O—— begged permission to make another examination. He made it, and gradually passed in his whole hand, forcing the soft pelvic bones apart, turned the child, and brought it through living. This was on a Saturday, and he came to me early on the Sunday, and with tears of joy in his eyes told me, 'Yesterday I saved a woman from the Cæsarean section, and also from death.'" Barnes records several other similar cases. On the other hand, Durham describes the case of a woman, aged 45, who had fractures of several bones, with no attempt at union, but at the post-mortem all the bones could be cut with a knife. Fehling had under his care a pregnant woman who fractured the upper part of the thigh in getting out of bed; she was completely cured after he had performed Porro's operation.

Nervous System.—Reference has already been made to the frequency with which this disease is, in its early stages, diagnosed as some affection of the spinal cord, in consequence of the existence of nerve symptoms. It has been customary to consider these to be the result of compression of nerve trunks; but this cannot be so, because they occur in the early stages before absorption of the bone salts. Increase of knee-jerk has been frequently noticed, and occasionally ankle clonus. Velits found in half of his cases rhythmical movements like those characteristic of cerebro-spinal sclerosis (but he considers them to be pressure symptoms). V. Braun had a case with tetanic seizures. Latzko attaches importance to the symptoms of pseudo-spinal paralysis, and considers that paresis of the flexors of the hip and contracture of the adductors are characteristic of the disease. Köppen found pain on pressure on nerve trunks as well as on bone, increase of knee-jerk, ankle clonus, in some cases muscular tremors, and in some difficulty in standing with the eyes shut. Pommer and Renz had each cases in which they diagnosed the existence of spinal disease. Trousseau and Lasègue found not only increased knee-jerk, but hyperæsthesia. Alterations of cutaneous sensibility are, however, rare.

Muscles.—From an early stage there is muscular weakness. The psoas and iliacus are generally early affected. The patient is unable properly to flex the thigh, and therefore cannot raise the

foot from the ground. To aid in the accomplishment of this the body is thrown to the opposite side, and the gait is thus waddling in character. Renz treated twenty-two cases, in all of which the diagnosis was certified by manual examination, and in all of them he found paresis of both legs. Köppen saw one case in which there were bone deformities without muscular weakness, but in the majority of cases he found muscular weakness before bone changes had taken place. He found the faradic and galvanic irritability of the muscles diminished; on two occasions he got contraction with the constant current.

Digestion may remain good. The respiratory and circulatory systems are only secondarily affected in consequence of and in proportion to the distortion of the thorax.

Generative System. — Apart from difficulties in parturition, because of distortion of the pelvis, the generative system seems to be healthy. Fehling, Runge, Velits, and Neumann state that there is increased fertility, but v. Winckel, Latzko, and others have adduced statistics to controvert this view. Fehling gives the average births for—Switzerland, 3·45; Germany, 3·9; his own cases of operation for osteomalacia, 5·4; Baumann's cases, 6·8; Rosenträger in 39 cases of osteomalacia in which Porro's operation was performed, 8·2; 242 other cases of healthy women, 3·7.

Several cases of osteomalacia which occurred about the climacteric had metrorrhagia. One very severe case recorded by Sippel defied other treatment, but was cured by oöphorectomy.

Urinary System.—It has been frequently stated that the urine is excessively acid. Senator doubts the truth of this. It is at least not an invariable, if it be a frequent occurrence. In the writer's cases it was not excessively acid, but often neutral or even alkaline, with a deposit of amorphous phosphates. An increase in the amount of phosphates excreted in the urine is recorded in a large number of cases. When it was discovered that the earthy salts were removed from the bones, attention was naturally turned to the urine, with the view of ascertaining the amount of them excreted. Many observations have been made; the results have been widely different. Solly found three or four times as much phosphate of lime as in normal urine; Kier about ten times as much CaO as normal; Hennig in seven cases observed the CaO normal or below normal, and in five cases increased. Barnes had careful analyses made of the urine of a nullipara, aged 40, in an advanced stage of the disease, and Bence Jones made a number of analyses of the urine of a man, aged 45, a patient of Macintyre's. In both of these cases there was a great increase of the alkaline phosphates, and only a slight increase of earthy phosphates. Chambers found similar results; in his case the alkaline phosphates were nearly double the normal average. Schramm and Wulff also found the alkaline phosphates increased; but whereas the former found the earthy phosphates normal, the case examined by the latter had

them diminished. Fehling made a series of careful determinations (*Archiv f. Gynæk.*, 1891) of the amounts of CaO and P_2O_5 passed in the urine by two patients with osteomalacia, and found the daily amount to be actually less than that obtained from the urine of a healthy person. Last year (*Archiv f. Gynæk.*, 1895) he made a more extended series of observations, at three periods, viz., before operation, soon after it, and at a later date; from these he was compelled to conclude that there was no constant result. In two of his cases the average daily amount excreted in the urine was greater after than before operation. He also compared the average discharge from a patient with osteomalacia with that from one lying next to her with fibroma uteri, the two having similar feeding for a period of eight days.

	Urea.	P_2O_5.
Osteomalacia, . .	29·33 gr.	2·05 gr.
Fibroma uteri, . .	30·94 gr.	2·19 gr.

In all these cases, however, the results were of less importance, because there was no exact comparison between the amount ingested, and the amount excreted both through the urine and by the stools. This has recently been done by Neumann (*Archiv f. Gynæk.*, Bd. xlvii. Heft 2, 1895) in relation to a married woman, aged 37, who came under his care in the Clinic six weeks after her ninth confinement. On admission she could only turn a little on the sides, but could not stand. She was carefully dieted, the CaO and P_2O_5 were determined in the food taken, also in the urine and fæces during two periods,—first, a period of seven days, beginning on 27th February, nine days after admission; and again during a similar period a month later, at a time when she was so far recovered that she was able to walk alone. Ten days after the close of the last observation she left the Clinic, although rather feeble, yet able to stand, and to walk without support.

In studying the following Table it must be borne in mind that seven weeks had elapsed after confinement, and that the patient had already been in the Clinic under favourable dietetic and hygienic conditions before the first series of observations was commenced. During the seven days of the first series of observations the excess of CaO ingested above that excreted was 5·33 grammes. A month later, by which time recovery had made considerable advance, and the bones might be expected to be in a more healthy condition, the excess of lime retained in the system was 3·8 grammes. During the first set of observations the Mg. excreted was in excess of that ingested, but during the second period more was taken than was excreted. The greatest difference is seen in the amount of P_2O_5 —during the first period 16·18 gr. was excreted during the seven days in excess of the amount taken, whereas during the last period 14·48 gr. more was taken in than was discharged.

		Total Ingested in 7 days.	Excreted.		
			In Urine.	By Stools.	Total for 7 days.
Feb. 27 to March 5.	CaO	27·5410	1·06	21·15	22·21 gr.
March 29 to April 4.	CaO	29·2160	0·80	24·60	25·40 gr.
Feb. 27 to March 5.	Mg.	1·3555	0·43	1·53	1·96 gr.
March 29 to April 4.	Mg.	1·4397	0·17	0·91	1·087 gr.
Feb. 27 to March 5.	P_2O_5	27·28	26·04	17·42	43·46 gr.
March 29 to April 4.	P_2O_5	29·93	12·72	2·73	15·45 gr.

Warschauer found in his cases of osteomalacia an increase of urea. Fehling in two of his cases, while they were at rest found 25·22 gr. (= 379 grains) and 29·33 gr. (= 452 grains) per diem, and in the former of them a very marked diminution after operation. Truzzi, on the other hand, taking N as a basis of his observations, concluded that in women suffering from osteomalacia the nutritive changes are very low; but some time after operation he found a marked improvement in this respect. Chambers also, in a case in which the muscles were almost entirely degenerated, found, as might have been anticipated, a great diminution of urea.

Bence Jones found in the urine of the case referred to, a deposit hitherto unknown. It slowly dissolved in cold water, more readily in boiling; it contained S and P, and he considered it to be an oxide of protein. He concluded from this that the patient was labouring under a distemper in which the gelatinous matter in the bones was not in a healthy state; that it was not simply phosphate of lime, but bone or bony elements,—that is, both gelatine and calcareous salts, that are carried out of the system.

Hermann found lactic acid in the urine, but several others

failed to find any. Petrone found nitrites, and he considered that the discovery of these was a strong proof of the truth of his theory of the origin of the disease. Zuccaro, Trotta, and Tschistowitsch also found nitrites, but they also obtained them from the urine of persons not suffering from this disease; and the two first named showed that they did not occur in fresh urine, but were the result of decomposition. In fresh urine they never got the reaction described by Petrone.

With the advance of the disease there is persistence of pain, increase of muscular weakness; the patient is confined to the house, then to bed, the general health becomes affected, and after months or years of suffering may die exhausted. Allison's case, a very exceptional one, recovered after twenty-four years' illness.

The occurrence of pregnancy usually causes a more rapid advance of the disease; after confinement there is a remission, and in some cases apparent recovery. Its severity does not depend upon the length of time which it has lasted. Some cases run a very rapid course, others advance slowly. Allison records a case which began in a girl at the age of 19 in the right leg; ten years later the pelvis was affected; and when she came under his care, the disease had lasted for about twenty-four years.

It is evident, therefore, that the symptoms which are characteristic of the disease refer to changes in the osseous system, and the consequences of these; also to changes in the nervous system. The earliest symptoms are pains due to congestion of the periosteum; these pains are aggravated by pressure and by movement. Muscular weakness occurs early, before evident bony changes; and they are due partly to a diminution of the distance between the origins and insertions of muscles. Alterations in the shapes of bones and of cavities—as, for example, contraction of the pelvis—are later symptoms. Nervous symptoms occur early and independently of pressure from changes in the bones. The disease may at any stage be recovered from, but frequently it progresses slowly or rapidly, continuously or with remissions and exacerbations.

Age.—There seems to be considerable difference of ages at which the disease occurs in different localities. A few cases are described as occurring at early ages, but it is doubtful whether they were not cases of late rickets. A case at a very early age is described by Rehn of Frankfort,—a female child, aged 16 months; the case was examined by v. Recklinghausen, who found rachitic changes at the ends of some bones, while others were characteristic of osteomalacia. Prof. Vierordt gives it as his opinion that osteomalacia in children has not yet been established. In the statistics of the death-rate in Bavaria the largest number of deaths from this disease is returned between the ages of 20 and 30.

	Youngest.	Oldest.	Average.
Berne Obstetric Clinic, 1867–89, .	25	41	35
Zurich Obstetric Clinic, 1870–89, .	32	42	38
Gelpke's Practice, Basel, . . .	25	58	38·5
Basel Obstetric Clinic, 1874–88, .	25	43	38
31 cases collected by E. Kummer, .	26	51	34·2
Turin Obstetric Clinic, cases by Gallia,	20	46	33·6
Cases collected by Truzzi, . . .	22	43	36·3

The preceding Table almost seems to support Fehling's statement that the disease is confined to the period of sexual activity, but we must remember that they are nearly all taken from obstetrical clinics. Michnow in 1889 showed a girl, aged 18, the subject of the disease, who had been affected for two years. Chambers had a case which began at 18. In Gelpke's practice there is one 58; von Späth operated on a woman, subject of this disease, at age 70; Weber examined the body of a woman, aged 71, who suffered from it; Gull had a case aged 54. Of the cases collected by Durham, twelve were over 50.

Sex.—Some writers have questioned whether it is not a different disease which occurs in men. Fehling is of this opinion. Kehrer records two cases in men, the sons of a woman who had osteomalacia. Durham collected 145 cases, of which 13 occurred in men. Litzmann in 131 cases found 8·4 per cent. in men, 91·6 per cent. in women. He says that as among men there is the absence of child-birth as a guide, probably many cases are overlooked. Milne Murray showed at the Edinburgh Obstetrical Society two pelves from male subjects which were in all respects characteristic of the disease (see Plate I.). In these specimens the lower dorsal vertebræ were moderately hard, but the lowest lumbar vertebræ and the pelvic bones were soft and easily cut with a knife. The following statistics are from the death-rate returns:—

1882-89.	Bavaria, . .	Women, 140	Men, 75
1881-86.	Italy, . . .	„ 170	„ 23
1880-88.	Switzerland (whole of),	„ 73	„ 6
1878-80.	Great Britain, . .	„ 71	„ 25

In the year 1880, in Great Britain, there was a change in the Registrar-General's Returns, which renders it impossible to obtain statistics of this disease after that year.

Pregnancy.—The frequent recurrence of pregnancy favours the production of the disease. If the disease be quiescent, the recurrence of pregnancy causes an exacerbation. The natural history of pregnancy is such as to afford an explanation of the more rapid progress of the disease during gestation. Casati found that in Milan from 1852 to 1870 there had been 62 cases, being about 7·7 per 1000 of obstetrical cases. Gallia in the Obstetrical Clinic of Turin from 1861 to 1890 found 27 cases, or 2·9 per 1000.

Volkmann, Fehling, Kehrer, and others divide the cases into puerperal and non-puerperal. The latter class includes nulliparæ and men. The proportion of puerperal cases reported by different observers varies considerably.

Litzmann in 131 cases found	64·88	per cent.	puerperal.
Hennig . . .	68·2	„	„
Casati	64·9	„	„
Italian statistics . .	81·0	„	„
Gelpke, of 19 cases .	94·8	„	„

Durham states that of 132 cases which he collected, in 91 the symptoms first appeared during or shortly after child-birth. Ribbert states that there is no difference in the anatomical characters of the bones of pregnant and of non-pregnant cases. Probably the difference is only a clinical one, in consequence of the absence of the peculiar reflex irritation which occurs during pregnancy. In men there is not that nerve influence which causes a periodic congestion of the pelvic organs and soft parts during menstruation. It is possible that the frequent congestion of the pelvic contents during menstruation and pregnancy affords the explanation of the frequency with which the bones of the pelvis are first and most seriously affected in women.

Lactation seems to favour the production of the disease. Kleinwächter says that Jewish women are specially liable to it, he thinks because they nurse their children longer than the other portion of the population. The influence of prolonged lactation alone is insufficient to produce the disease, because it is unknown in Japan, where it is customary to nurse for two or three years. Gelpke found that, of 24 cases of osteomalacia, four nursed very long, nine nursed, five nursed a little, and six did not nurse at all.

Menstruation.—Hennig describes a catamenial form. Collineau found, in 52 cases, that 14 had exacerbations at the menstrual periods. Such exacerbations are not, however, the rule.

Locality.—Von Winckel, sen., before 1861 had performed Cæsarean section for osteomalacia thirteen times. Latzko in 1894 stated that he had himself observed 50 cases of the disease. He does not believe that it is endemic, but that certain men are interested in it and capable of diagnosing it. Kehrer since 1881 had seen about 45 cases in the Heidelberg Clinic. In October 1894 Truzzi tabulated a large number of cases which, between 1887 and 1894, had been operated upon by various gynecologists, —viz., Fehling, 14 cases; v. Velits, 12; Schauta, Löhlein, Truzzi, each seven; Chrobak, five; Hofmeier and Müller, each four; v. Winckel, Kotschau, v. Kézmárszky, two each.

From the death-rate returns, and from the above statistics, it is evident that osteomalacia is more frequent in certain localities than in others, even if we were to admit that Latzko's statement contains a measure of truth. The disease is somewhat common in

Italy and Switzerland, in Bavaria, Wurtemberg, Baden, and Alsace; it is less common in Austria; rare in North Germany, Russia, Northern Europe, Great Britain, and France. It is a matter of very considerable interest that, whereas it formerly prevailed in Gummersbach and in Sottegem, these districts are now almost free. Gallia states that of 27 cases which have occurred during the past thirty years in the Turin Clinic, the greater number came from a district of which the soil is poor in lime salts. Pommer and Litzmann state that the disease is more common in asylums than elsewhere; also that it sometimes follows psychoses.

MORBID ANATOMY.—The morbid changes which are most apparent and constant, and which have been longest recognised, are those in the bones. The morbid process is not invariably the same; in some cases bone absorption seems to be the chief element, in others the absorption of the earthy salts, leaving a large amount of the animal basis of the bone; there is also a variable amount of a regenerative process which goes on at the same time. When a large amount of the bone salts has been removed the bones become more flexible, and in the later stages they may be cut with a knife.

In the earlier stages there exist dilatation and congestion of the medullary vessels,—Rindfleisch says a passive congestion approaching to stasis,—and small hæmorrhages in the medulla are frequently seen. In the long bones the medullary cavity is enlarged, the bone becomes more cancellous, and in the short and flat bones the cellular spaces coalesce so as to form larger cavities. On microscopic examination, the bone salts are seen to have been removed from small areas round the Haversian canals, and immediately beyond the decalcified area the bone seems to be normal. As the disease advances the earthy salts are removed from a gradually increasing depth round the canals. In the areas in which an absorption of bone is going on osteoclasts are seen just as in normal bone where absorption is taking place. There is a total absence of inflammatory exudation.

As the disease advances, when the periosteum is stripped off there are seen a number of openings in the bone, from which, in advanced cases, clear fluid exudes. On section the cancellous structure is seen to be much more open, the medullary portion of the long bones pale and oily. Ribbert takes the same view as Rindfleisch, viz., that decalcification is the earlier process, and that later the organic portion also may be absorbed. Ziegler describes the process as consisting essentially in a softening of the bones. Pommer, on the other hand, from his own investigations, believes that the process consists essentially in bone absorption, and that there is little decalcification. The existence of lactic acid in the bones has been frequently noted, but there are many cases on record in which careful examination has revealed no trace of that acid, and the question has been raised whether its existence

in some cases may not have been due to post-mortem changes. Virchow found an alkaline reaction in the bones.

In osteomalacia, even while absorption is going on, there may also be seen side by side with it a process of new formation, and in stained specimens the combination of the two processes has been observed. Truzzi, on the one-hundredth day after operation, when recovery had already made considerable progress, removed a portion of a rib, and found in it changes which both Ribbert and von Recklinghausen describe to be characteristic of regeneration of bone. After fracture the callus is softer and more porous than that found in connexion with healthy bone, and it is not replaced by true bone.

Analyses of the bones have been made by several observers. The results have been widely different. This might have been predicted, because the results will vary in relation to the stage at which the disease has arrived, as well as in relation to the individual characters of the case.

	Osteomalacia.	Normal.
Mörs and Muck—		
Inorganic,	38·2	68·0
Organic,	61·8	32·0
Durham—		
Inorganic,	45·5	68·73
Organic,	54·5	31·27
Kehrer—		
Inorganic,	20·89	
Organic,	79·11	
Lehmann (average of four analyses)—		
Inorganic,	24·40	
Organic,	75·60	
Weber (average of three analyses)—		
Inorganic,	49·94	
Organic,	50·06	

The condition of the *pelvic organs* has been noted in a large proportion of the cases operated on. Fehling was the first to describe certain changes in the uterine appendages as characteristic of the disease, chiefly an increased vascularity, with the veins much increased in size, also a friable condition of the ovaries. The friability was so great in some cases as to increase the difficulty of fixing a ligature round the ovaries before their removal. The friability of the tissues is exemplified in a very interesting case, as reported by Underhill, in a woman, aged 28, who had spontaneous rupture of the posterior wall of the uterus at the time of her third confinement. The first symptoms had shown themselves during her second pregnancy, and had progressed during the third, so that her pelvis was beaked and the spine of the ilium on one

side bent. Underhill performed Porro. The friability of tissues was noted, and the stump separated with unusual rapidity.

In relation to the congestion which was observed by Fehling it must be borne in mind that many of his cases were at or near the full term of pregnancy. Of Orthmann's 41 cases, only eight had congestion or increased vascular development. Von Velits was the first to call attention to hyaline degeneration in the arteries to the ovaries, and also hyaline changes in the ovaries themselves. Rossier made a careful study of the microscopical condition of the ovaries from three of Fehling's cases, and found the hyaline changes referred to. Orthmann, Truzzi, and Neumann also described similar changes. Orthmann believes that they are characteristic of osteomalacia, whereas Kleinwächter and Winckel think that there are no changes in the uterus and its appendages which are peculiar to that disease. Some consider that they are a consequence, not the cause of the disease. Löhlein, who has had a large experience, found a variety of conditions,—ovaries congested, normal, atrophied, also cystic; Neumann had a similar experience. Hofmeier, in a nullipara, aged 30, found the ovaries atrophied and the appendages otherwise apparently normal. The ovaries removed by Professor Simpson were very carefully examined by Dr Gulland at the Laboratory of the Royal College of Physicians; they were normal.

Muscles.—Friedreich found multiplication of the nuclei of the muscular fibres, and also other changes like those of progressive muscular atrophy. Chambers examined the muscles of a woman, aged 26½, in whom the disease had begun seven and a half years previously, and in whom it advanced with great rapidity during the last six months of her life. Her bones were quite soft, so that "she could be rolled up like an ill-stuffed bolster;" she decreased in height from 4 ft. 10 in. to 3 ft. 1½ in. Chambers's impression was that the muscular changes preceded the bone changes. The muscles were to the naked eye homogeneous, and under the microscope there was no trace of fibrous structure, but abundant fatty change. Weber examined the muscles of an old woman, aged 71, who had characteristic bone deformities in pelvis, spine, and thorax; he found well-marked fatty changes in the muscles. Köppen found slight microscopic changes, but he believes that the early alterations are chemical in character.

The Nerve Centres have not often been examined, but both Pommer and Renz have found evidence of central nerve disease. Further careful examination is desirable.

The Blood has been frequently examined, but no constant changes have been discovered. Von Jaksch was the first to note a diminution in its alkalinity. Neusser found the eosinophilic corpuscles increased; but he also found a similar condition in many other illnesses, such as diseases of the sympathetic nervous system, pemphigus, and even during menstruation. Fehling examined

several cases, and found no increase of these cells. Chrobak and Sternberg also failed to find them. Seeligmann in a pregnant osteomalacia patient found the hæmoglobin to be 41 per cent., with an increase of white corpuscles; after operation the hæmoglobin increased to 49, then to 72 per cent., and the white corpuscles diminished considerably. Tschistowitsch found the lymphocytes increased, the mononucleated leucocytes and myelocytes increased, and the red corpuscles poor in hæmoglobin.

Wislicenus found lactic acid in the dropsical fluid from a case of osteomalacia.

Bacteriology.—As the disease was noted to be endemic in certain localities, it was supposed that it might be zymotic, consequently the various tissues of the body, including the blood, have been subjected to very careful examination by means of the most recent bacteriological methods, but no constant result has been obtained. Petrone thought that he had discovered the cause in an organism he found, which he called a *fermentum nitricum*, and with which he made a series of experiments on animals. Soon after this Winogradsky discovered in the soil an organism of nitrification, and made a number of researches in relation to it. This discovery was supposed to support Petrone's theory, which he had based on his observations. Numerous researches have been made with the view of verifying Petrone's theory; these have yielded a negative result. Löhlein had a portion of bone removed during an operation for the cure of osteomalacia, but no micro-organism was found.

Researches on Animals.—There has frequently been observed among animals a disease of which one of the symptoms is softening of the bones, and many of the animals die exhausted. They suffer pain which is aggravated by movement, they have apparently stiffness of the limbs, a straddling gait, the bones become deformed, often fractured. The anatomical conditions are said to be the same as in the human subject, a statement which has been confirmed by Prof. v. Recklinghausen. Zürn found cocci in the marrow of affected animals, which he believed to be evidence of parasitic origin; but it is to be noted that putrefactive bacteria were also present. V. Winckel, Hennig, Casati, and others state that the disease is analogous to that in man.

According to Roloff, who has studied it carefully, the disease is endemic in a well-defined area in Astrettingen, near Augsburg. It prevails more or less each winter over the district of Hinschöfen, in Villingen, Baden, and in other places. In Norway in 1869 there occurred not fewer than 2142 cases of a disease characterised by the above symptoms, and of these 448 had to be slaughtered. The disease occurs sporadically in some parts of Europe after dry summers. In Astrettingen the disease affects chiefly milk cows, rarely oxen; when the sick animals are sent out of the district they quickly recover. It is stated that in dry summers the food receives little lime from the soil; also that the soil of affected

areas is damp, sandy, and poor in lime. A variety of experiments have been made with the view of throwing light on the cause of this disease. Roloff fed three cows on food free from lime, and in a month and a half they became affected with softening of the bones, but recovered when phosphate of lime was added to the food. Three cows, hitherto healthy, were fed on hay from a district noted for osteomalacia; they became affected, and were cured by the administration of phosphate of lime. Four goats fed on the same fodder with lime-water to drink did not become ill, but in other cases the drinking of lime-water was not sufficient to cure the disease. From these researches it was concluded that the disease was due to the scarcity of phosphate of lime in the food.

Heitzmann made a series of researches on animals with lactic acid. He used a pure acid, and administered it in some cases with food, in others subcutaneously. The animals which he employed, fifteen in number, were dogs, cats, rabbits, and one squirrel. In two weeks the flesh-eaters showed swellings of the epiphysial ends of the long bones, swellings at the junctions of ribs and cartilages, also diarrhœa and wasting. Later the swelling disappeared, the long bones and scapulæ became flexible, the long bones also liable to fracture. The microscopical characters resembled those of osteomalacia in man. In the herbivora, on the other hand, there was no thickening of epiphyses, the cortical layer of bones was thinner, and they were brittle. From these experiments Heitzmann concluded that in carnivora lactic acid produces, first rickets, later osteomalacia; in herbivora there is produced osteomalacia without a stage of rickets. Siedamgrotzke, on examination of the bones of animals treated in this way, found a want of salts, but no evidence of the changes characteristic of rickets.

Heitzmann notes that a young woman who fed the animals on which he experimented gave birth to a 7½ months' child which exhibited evidences of a high degree of rickets. He asks the question whether it were possible that the manipulation of the acid had any causal relation to the rickets in the fœtus.

DIAGNOSIS.—There is not as yet any means of diagnosing osteomalacia in the early stages. It is most frequently mistaken for *rheumatism* or *spinal disease*. If there be pain in the sacrum or pelvis aggravated by pressure, and if along with this there are spinal symptoms, such as increased knee-jerk, we may suspect osteomalacia. The suspicion would be strengthened if with these symptoms there were inability perfectly to lift the feet in walking, and thereby a waddling gait were produced.

When deformities are produced and the patient diminishes in height the diagnosis is easy, except in so far that *osteomalacia carcinomatosa* presents the same symptoms. A history of previous cancerous disease, or evidence of its existence elsewhere, might enable a diagnosis to be made, and it is stated that in the latter disease the patient's general condition more rapidly fails.

From *rickets* there should be no difficulty: this is a disease of early life; osteomalacia affects adults only. Vierordt holds that osteomalacia in children has not yet been proved. In rickets there is swelling at the epiphyses of the bones; there is not much pain; the limbs are often bent. In osteomalacia there is no swelling at the ends of bones; but there is considerable pain, which is aggravated by pressure; and usually the lower limbs are straight.

Examination of the blood and of the urine are not of much value in aiding diagnosis.

TREATMENT.—After reading Senator's paragraphs on the prognosis and treatment of this disease, in von Ziemssen's *Cyclopedia of Medicine*, we can hardly fail to be struck with the almost hopeless view which was taken of osteomalacia at the date at which his article was written, viz., twenty years ago. Although we are warranted in now taking a much more hopeful view, there still exists a considerable diversity of opinion as to the best method of treatment. V. Velits, Stern, Harajewicz, Preindlsberger, and Neumann look upon oöphorectomy as an infallible cure; but there are on record several cases in which that operation was not followed by recovery, and there are also several which have recovered under medical treatment only, therefore we are justified in still considering the treatment under two divisions, viz., medical and surgical. That which should be adopted in any particular case will depend upon the stage of the disease, and also upon the existence or absence of pregnancy. There are those in which the affection advanced steadily during pregnancy, but apparent recovery followed confinement. There are also on record several cases in which recovery took place after the climacteric. It should also be remembered that in some women the disease did not show itself until after the climacteric had passed.

Internal Remedies.—Labadie, Labusquière, von Braun, Trousseau, and Busch have obtained good results from internal treatment alone. A very severe case of Trousseau's, which has been already referred to, recovered under the use of cod-liver oil. Trousseau also records another case of which the cure was complete after treatment with that remedy. Allison's case, which had slowly progressed for twenty-four years until the woman was in a condition of extreme deformity and emaciation, began to improve soon after the administration of bone marrow,—a glycerine extract from the cancellous tissue of the leg bones of the calf, with some admixture of bone salts.

The internal remedy which seems most frequently to have been followed by benefit is phosphorus. Von Winckel, Latzko, and Bamberger have recorded cases of cure after its use. Sternberg says that large doses of phosphorus with patience for a long time are a veritable specific in early stages. He records four cases of his own and 17 by others which have been cured by phosphorus.

Neumann had one patient whose uterus and ovaries were removed at term. She improved, left bed on the nineteenth day; but the pains returned, and by the twenty-seventh day she was worse. Under treatment with phosphorus she recovered so as to be able to walk without support. He had a similar experience in another patient. Chrobak had two cases, one of oöphorectomy and one of Porro, which did not recover until after treatment with phosphorus; and Weil records a case of a woman, aged 50, in whom the disease came on at the menopause, who was cured by that drug.

Baths.—Pelezar treated eight well-marked cases of the disease, ill from two to eight years, by means of sodium chloride baths, and internally lime-water in milk. The patients experienced relief after the first few baths, in from four to eight weeks there was great improvement, and in some it is stated that bony deformities disappeared. He attributes the good effects to an improvement of nutrition and stimulus to metabolism by the baths. Weisz records two cases of women in middle life who were cured by the use of sulphureous waters and sulphur mud baths. Fischer had a case of a multipara in whom there was considerable deformity. Under treatment by phosphorus and salt baths she recovered, and passed safely through another pregnancy without recurrence of the disease.

Chloroform.—Petrone, who believes that the disease is caused by a micro-organism—*fermentum nitricum*—advocates the use of chloroform inhalation as a germicide. He advises that the narcosis be prolonged for three-quarters of an hour, and in some cases he has administered chloral in doses of 2 grammes daily for a week. Tibone and La Torre also gave chloral with success. Fehling, Chrobak, and Trotta each tried several chloroform narcoses, and also gave chloral hydrate, but without benefit. Latzko advises the trial of chloroform narcosis. He says that in the majority of cases it leads to a marked amelioration of the pains, but that these recur with extreme rapidity. In all the cases, except one in which the result was permanent, after a longer or shorter delay the pains recurred with the return of menstruation. He nevertheless advised that this means be tried along with the internal administration of phosphorus. Fehling had a case in the early months of pregnancy which was treated both with chloral and with prolonged chloroform narcosis, nevertheless the disease progressed rapidly. Neumann, in Case No. 2 of his series, tried chloroform, with only temporary amelioration. The advocates of the chloroform treatment point to a case of Schauta's in which ether was given as the anæsthetic for the removal of pyosalpinx; no improvement in the osteomalacia followed, but after chloroform narcosis recovery began. Against this there may be placed cases of Kummer's, in which anæsthesia was produced by ether for the removal of tubes and ovaries, and the results were as good as those in which chloroform was used.

In the majority, however, internal remedies were not followed by cure of the disease.

Surgical.—The present surgical method of treatment has been gradually evolved out of the results of operation at full term when deformed pelvis prevented delivery *per vias naturales.* The first recorded case in which an osteomalacic pelvis was a hindrance to delivery is stated to have been by W. Cooper in a letter to Wm. Hunter in 1776. The first Cæsarean section in a case of this disease was by Stein, senior, 1783. Von Winckel, senior, before 1861, performed Cæsarean section thirteen times for osteomalacia, with a result favourable to the mother on six occasions. Von Späth and von Braun removed the uterus and ovaries expressly for the cure of this disease, but both cases ended fatally. Fochier (Lyons) in 1879 and Levy (Copenhagen) in 1880 expressed their opinion that the removal of uterus and ovaries would be a suitable operation for its cure. Kleinwächter and Sänger had recoveries from osteomalacia after having performed Porro's operation, and believed that the benefit resulted from removal of the ovaries. Reference has already been made to a case in which Underhill performed Porro's operation for rupture of the uterus; cure of the osteomalacia resulted. Fehling enumerates 24 cases in which, up to 1888, Porro's operation had been performed for the cure of this malady with successful result. In 1886 he thought that the benefit was due to the removal of the ovaries, and in January 1887 he performed his first double oöphorectomy for the cure of the disease, also twice early in 1888. At the Gynæcological Congress in Halle in 1888 he said that in such cases in which other methods of treatment had failed, if the patients had already several children and were unfit for work, he would remove the ovaries alone. Accordingly, on 9th July of that year, in such a case he performed double oöphorectomy for the cure of osteomalacia, and a second one shortly afterwards. Since that time he has removed the ovaries even from several non-puerperal women for the cure of the disease. This operation has become an acknowledged method of treatment. Few cases have been recorded in this country, but Rasch in March 1892 treated a woman, aged 41, in whom the disease began in 1890, after her third confinement. After a new conception in October 1891 she got rapidly worse. Rasch in March 1892 induced abortion, and eight weeks later, as there was no improvement, he removed the ovaries. This was followed by recovery. Von Winckel in May 1893 published a paper in which he records 40 cases of removal of the ovaries alone. Of these he had followed 16 for a long enough period to be sure of the result,—in 12 he was able to record a cure, and in four improvement. He points out that the operation cannot be said to have a definite and certain result. Truzzi in 1894 records in a tabular form the particulars of 98 operations on 97 patients for the cure of osteomalacia. (A translation of Truzzi's table

is appended to this paper.) In 82 of these the ovaries alone were removed, in eight there was in addition ventrofixation of the uterus for retroflexion, one in which the tubes also were removed because of pyosalpinx; in six the uterus also was removed. Of these only 52 had observations made at a time sufficiently remote to be sure of the ultimate results. These were as follows:—

Complete cure, . . .	36	Improvement, . .	3
Almost complete cure, .	4	Persistent relapse, .	5
Cure consecutive to relapse,	3	No change, . . .	1
	43		9 = $\frac{1}{5}$

Truzzi questions whether, as recovery has not in several cases followed the removal of the ovaries, it might not be better to remove also the uterus. He believes that a more profound and extensive mutilation of the sexual apparatus will have a more considerable influence on the disease. In one of his patients after double oöphorectomy (No. 58 in his table), relapse occurred; fifteen months later he removed the uterus, and very marked benefit resulted. But it must be remembered that there have been failures after removal of the uterus as well as ovaries. Chrobak, Neumann, and Beaucamp record such cases. Chrobak's case was afterwards cured by the internal administration of phosphorus. Von Späth performed Porro's operation, but left the ovaries, in a woman aged 70; she completely recovered. It must, however, be borne in mind that after removal of the uterus the ovaries quickly atrophy. In 1889 Baumann collected statistics of 44 cases in which Porro's operation had been performed for the cure of osteomalacia; 18 died from the results of the operation, three died later from other diseases, two could not be traced, 21 recovered, but of these there were four in whom there was only improvement in symptoms. Seeligmann gives the death-rate after Porro as 30 to 36 per cent., after oöphorectomy 5 per cent. Harris has collected statistics relating to 500 cases of various diseases in which Porro's operation has been performed since 1876. In the first hundred cases the mortality was 60 per cent., but in the last hundred only 14 per cent., and of these 14 there were five who were ill with fever before the operation. He also gives the mortality in different countries, varying from 64·4 per cent. in France to 22·1 per cent. in Austria. Some operators have had extraordinary success,—Breisky 11 consecutive cases, Riedinger and Leopold each seven cases—all without fatal result.

It has been claimed that the curative results in relation to osteomalacia are more favourable after Porro than after oöphorectomy. Statistics do not bear out this statement; and when, even with improved methods, we note the much lower mortality after oöphorectomy, it is evident that the introduction of the latter

operation by Fehling as a curative measure is a distinct advance. In 15 cases Cæsarean section alone was performed, but the curative results in relation to osteomalacia were not so good as after Porro; in nearly all of the cases there were relapses, specially with the recurrence of pregnancy. If Cæsarean section be performed, the ovaries should be removed in order to prevent the recurrence of pregnancy.

Dümmock performed symphyseotomy on a Hindoo woman to permit of delivery; she completely recovered from the osteomalacia. A very interesting case by Seeligmann is worthy of note in relation to treatment. The case was a very severe one. The woman had lost very much in height. Six days after having performed Porro, while the bones were still soft, he applied extension with a wonderful result in the increase in height. After seven years of bedridden life with severe pain and great deformity, the patient recovered the power of walking and of attending to her household duties.

If we sum up the foregoing experiences it would appear—1. That in non-pregnant women and in men a sufficient number of cases of recovery after internal treatment has been recorded to warrant its being tried, provided the case is not very advanced. The methods of medicinal treatment which have proved most successful are favourable hygienic conditions, good food, the internal administration of phosphorus, bone marrow, and the use of salt baths. It should also be remembered that there have been a few cases of favourable result after chloroform narcosis. Pyschological changes have been reported in some women after the ovaries have been removed, therefore that kind of treatment should not be recommended until other remedial measures have been fairly tried; but both in medicine and in surgery the weal of the patient occasionally demands that we choose the less of two evils; therefore,

2. If these fail, or if the case be advanced with considerable deformity, then oöphorectomy should be performed without delay in order that bone changes and deformities may, if possible, be prevented. At the same time it might be well to bear in mind Löhlein's view, that oöphorectomy does not directly cure but is a substantial aid in that direction, therefore cases should be kept under observation for some time after operation.

3. In pregnant women having such a contraction of the pelvis that the birth of a viable child is impossible, operation must be performed sooner or later. It has been much discussed whether abortion should be induced and at a later date the ovaries removed; or whether, if the disease be not progressing rapidly, it would not be better to wait till term, then to operate, either by Cæsarean section and removal of the ovaries, or by a modified Porro. Velits advises Cæsarean section and removal of the ovaries, but several others, among them Neumann and Chrobak, advise the

removal of the ovaries and uterus after the method adopted by Chrobak.

If the disease is progressing rapidly, operation should be undertaken without delay.

After operation one of the striking features is the rapid disappearance of pain,—pain which was elicited by pressure on the bones, and which was so greatly aggravated by movement. The absence of this pain renders it possible for the patient to undertake movements which were hitherto avoided, but in advanced cases the recovery of complete control of the muscles is slow, seeing that in them the want of power arises in some measure from the approximation of the origins and insertions of the muscles. In the majority of cases there is no return of menstrual flow after the removal of ovaries. It recurs more frequently in those cases in which the operation has been done for fibroma than for osteomalacia. Of 14 cases in which Fehling performed double oöphorectomy for osteomalacia there was a slight discharge on four occasions, and in one case only a copious flow. Among 78 cases collected by Truzzi he found that in seven there was pseudo-menstruation.

ETIOLOGY.—Regarding the etiology of the disease, there are four classes of theories.

1, Zymotic; 2, Reflex-nervous; 3, Dietetic; 4, Altered Chemistry.

1. *Zymotic.*—Petrone believes it to be due to a micro-organism —*fermentum nitricum*—which occurs in the soil, and produces in the system an acid which dissolves out the earthy salts from the bones. He believes his theory to be supported by his discovery of nitrites in the urine. He made pure cultures of the organism, which he obtained from patients who were suffering from osteomalacia, injected these into dogs, and found that these contracted a disease similar to that in man. His theory received support from the discovery in the soil, by Winogradsky, of an organism of nitrification. This would, according to Petrone's theory, explain the endemic character of the disease. This theory receives support from Latzko, Baumann, and others.

Kehrer classifies the disease among endemic zymotic diseases, such as beri-beri, and therefore to some extent supports Petrone's theory. Löhlein thinks that probably specific germs exist, but that they have not yet been demonstrated. Winckel also considers the disease to have a parasitic origin. The organism which was described by Petrone has been carefully sought for by other observers, but they have failed to find it in the bones or in the soft parts during life, as has already been pointed out. The changes in the urine which he describes are not characteristic of osteomalacia; the nitrites found by Petrone do not occur in the fresh urine of patients suffering from that disease. Zuccaro conducted a series of careful observations in relation to this subject. He

found nitrites twenty-four hours after emission, but never in fresh urine. This rendered it probable that they arose from decomposition. The examination of the urine of other sick and of healthy persons yielded similar results. Trotta made numerous observations in gynecological and in surgical cases, as well as during pregnancy, and never found in recently passed urine the reaction described by Petrone; but, like Zuccaro, he found it in older urine. He also examined the urine of a patient suffering from osteomalacia, with similar results. Tschistowitsch also found nitrites in the urine, but he obtained a similar reaction in the urine after pneumonia, pleurisy, and other diseases. Cattle affected with a disease said to be identical with osteomalacia recover when they receive an abundance of phosphate of lime in the food. This is not in keeping with a zymotic theory of the disease.

2. *Reflex-nervous.*—Fehling believes the disease to be a trophoneurosis of the osseous system, due to a pathological activity of the ovaries. The latter are, he thinks, the point of origin of a reflex influence to the vaso-dilators of the vessels of the bones, determining a passive hyperæmia, and a consecutive resorption of the elements of the bone. Castration by suppressing the focus of origin of these reflexes, causing the action on the vaso-dilators, would have as result the contraction of the vessels, and a cure of the disease. Thorn, Hofmeier, and others support Fehling's theory, whereas von Winckel, Kleinwächter, and others reject it. Fehling finds in the congestion of the uterus and its appendages, and in the amyloid degeneration of the ovaries, which has been found by many observers, evidence in support of his theory; but von Winckel points out that of Orthmann's 41 cases only eight are reported to have had congestion, or increased vascular development. Various observers believe that the changes in the ovaries are the result and not the cause of the disease.

The strongest argument against Fehling's theory is afforded by those cases of recovery from the disease in which the ovaries were left after Cæsarean section, also those cases in which the removal of the ovaries did not produce cure. Aly, Fehling, Chrobak, Chiarleoni, and Schauta have each reported a case of non-recovery after removal of the ovaries, and Truzzi reports two among his cases. It is to be noted that in one of these the left ovary was enveloped in adhesions,—possibly it was not entirely removed; the case improved after vaginal hysterectomy. In the other case, even after operation, there were attacks of metrorrhagia, accompanied by exacerbations of osteomalacia. Von Winckel opposes Fehling's theory because of a variety of considerations, the most important of which are,—that the effect of menstruation on the disease is by no means constant, that if it depended on menstruation there should be an increase of pain on the appearance of pseudo-menstruation, which von Winckel finds to set in frequently from one to four days after operation; whereas Fehling shows that at this

time there is a striking decrease in pain, that the anatomical changes in the ovaries and their surroundings are not characteristic of osteomalacia, and that the disease rarely occurs in those who suffer from affections which are marked by congestion (tumours displacements, etc.).

3. *Dietetic.*—Gelpke divides the causes of the disease into three groups:—1, Sexual, in pregnant women; 2, Hygienic,—puerperal osteomalacia attacks only those having unfavourable surroundings; 3, Territorial. He believes that in certain districts the food is poor in phosphoric acid, and that in these districts there gradually arises in a population bones with a small power of fixing bone salts. These pathological constitutions transmit themselves from generation to generation, and so there is evolved in that population a latent osteomalacia; then there comes in the influence of pregnancy, lactation, damp dwellings, or poor food, and the disease breaks out.

Von Braun blames poor food and unfavourable dwellings for the majority of cases. Conheim thinks that the disease is due to an altered relation between the supply and destruction of lime salts, and states that in pregnancy there is a greater demand on the tissues of the mother.

There are two facts which militate against the theories that the disease is due to a want of lime salts in the food or drink. 1*st.* It has long since been demonstrated that the earthy salts of the bones are not derived from drinking water,—that some of our largest boned communities use water which is peculiarly free from lime. 2*nd.* Whereas improper or insufficient food may aid in the production of the disease in those who are predisposed to it, by lowering the general tone of the system in a way similar to that of other debilitating influences, it is to be noted that the disease occurs in well-fed, comfortably-housed individuals, and that in some of the districts in which the disease is common, such as Rhineland, the general condition of the people is much better than that in other nations; for example, in Ireland and in parts of Russia, where the disease is hardly known. Further, softening of the bones is not one of the incidents in the history of starving populations during famine.

4. *Altered Chemistry.*—After the discovery of lactic acid in the bones by Hermann and others, the theory was formed that this acid acted as a solvent, and removed the earthy salts from the bones. Schmidt believed that phosphoric acid was the solvent. Rindfleisch considers the disease to be a malnutrition, and points to the dilatation and congestion of medullary vessels, the constant presence of extravasations, the total absence of inflammatory infiltration, and finds in these conditions evidence of a passive congestion approaching stasis. He points out that there is an excess of CO_2 in blood which stagnates, and ventures the hypothesis that this may be the solvent which removes the bone salts. He further

points out that in old people the periosteum becomes thicker, more vascular, that those vessels which pass from the periosteum to the surface of bone become congested, and that these changes are associated with a peripheric absorption of the cortical layers of bone. But if this disease were due to a continued passive congestion, we would expect that in diseases characterised by an aggravated condition of passive congestion similar changes should occur; they are not found.

Senator thinks that as the changes undoubtedly spread from the bloodvessels, and their results are like those produced by an acid, and as an abnormal amount of acid has been demonstrated in the bones, we are justified in attributing the altered state of the bone tissue to a perverted condition of the blood, viz., an insufficient alkalinity of it.

Bouchard thought that the disease is not simply insufficiency of alimentary materials, nor a want of phosphates, but that "it is above all due to a vice of nutritive changes, which leads to the accumulation of organic acids, which may enter in excess because of abnormal digestive fermentations, or it may be from intra-organic fermentations, or nutrition goes on too slowly and diminishes oxidation processes. A large number of hygienic circumstances affecting respiration and circulation, or influencing the nervous system, may alter the activity of metamorphoses, and may create a feeble or delayed nutrition. In all these circumstances organic acids may not be burnt off, the alkalinity of the blood diminishes . . . the intimate constitution of the tissue is altered by the ready solution of, or the interference with the deposit of, mineral elements."

Orthmann questions whether there is not an influence between the changes in the ovaries and the broad ligaments—the increased congestion of them—and the congestion of the bones. From this congestion there arises a diminution of the hæmoglobin, a diminution of alkalinity, with a solution of lime salts from the bones.

As a criticism of those theories which account for this disease on the ground of a diminution in the alkalinity of the blood, with an excessive amount of lactic acid or of some other acid in the bones, it may be pointed out that in some cases of osteomalacia which were carefully examined no lactic acid was found, and no diminished alkalinity of the blood; that in many diseases, such as gout and rheumatism, there is an excess of acid present without softening of bones. It must also be constantly borne in mind that the removal of the bone salts is only an early stage of the disease, and that later the animal basis is also removed, that portion which is not soluble in dilute acids; further, that by means of osteoclasts the bone structure may be removed.

Ducrest made a series of investigations into the modifications experienced by the entire organism during gestation. He found that pregnancy causes a degree of softening of the bones. From this Trousseau concluded that there exists in pregnant women a

certain kind of rickets, of which osteomalacia may be considered as a more advanced stage.

Hanau supposes that there is a certain physiological degree of bone softening in each pregnant woman because of the call upon her for a supply of lime to the growing fœtus. In certain districts and in predisposed individuals this passes into a pathological condition, and osteomalacia results.

Truzzi, as a result of his experiments on animals, in which he induced anæmia by artificial methods, leans towards the hypothesis of Senator, Eisenhardt, Sasse, and Ribbert. He thinks that the origin of osteomalacia must be sought in biological facts of bone marrow, which in the female are intimately associated with menstruation, pregnancy, and the whole of sexual life. He refers to the researches of Foa and of Marchiafava, which show that bone marrow tends to become redder during pregnancy, and that there appear a number of nucleated red corpuscles. Litten, Orth, Bizzozero, Golgi, Foa, and Salvioli think that in the pregnant woman there is an increased activity of the hæmopoietic function of bone marrow, probably in order to a compensatory regeneration of the elements of the blood. This great work of blood reproduction, which may become abnormal, the low vitality of imperfectly formed elements, and as a consequence their more easy destruction,—above all, the numerous extravasations seen in osteomalacia, the decomposition of lecithin, and the production of acids, lead Truzzi to consider that the study of bone marrow in relation to osteomalacia is of the greatest importance. He thinks that it is in the conditions of this tissue, in its transformations during sexual life, that we should recognise, if not the chief reason for osteomalacia, at least one of the most important factors which disposes the skeleton of woman to this dire malady during sexual life.

Truzzi's argument is one of importance, because doubtless the effect of pregnancy and of menstruation on the changes in bone marrow form an important element in the production of the disease, and may account in some measure for the exacerbations which occur occasionally at the menstrual periods, and more frequently during pregnancy, but that condition is not of itself sufficient to originate a disease which occurs in males, in nulliparæ, and even after the climacteric period, also after the ovaries and even the uterus have been removed.

Curatulo, according to the general doctrine of Brown-Séquard, believes that the ovaries introduce into the blood a secretive product, the chemical constitution of which is still unknown, capable of facilitating the oxidation of the phosphoric organic substances which supply material for forming the salts of the bones. He made a series of experiments on bitches, removing their ovaries. They were fed on a constant diet both before and after operation, and the nitrogen and phosphorus were carefully determined. He found no change in the secreted nitrogen, but the phosphoric

anhydride was after operation diminished by one-half,—before operation, 1·50 grammes; after operation, 0·75 grammes. Curatulo believes that this change is due to a diminished oxidation of phosphorus existing in an organic form in the tissues, which being stored by the system and combining itself with Ca and Mg, would accumulate in the bones in the form of phosphate of lime and magnesia. This observation is of great interest in relation to the disease; at the same time, it does not account for its production or its recurrence after the ovaries have been removed. In the absence of further research the precise significance of these observations cannot be ascertained. Is the diminution due to a diminished metabolism of lecithin and nuclein, or to diminished nutritive changes in the bones? What is the relative proportion of phosphorus excreted in the stools, and whence is it derived?

Several of the foregoing theories leave out of view the facts that not only the salts but also the organic parts of the bones are removed,—in other words, that the essential character of the disease is trophic. The trophic nature is borne out by the microscopic characters of the bone both during the stage of advance and also during recovery. Another fact not sufficiently recognised is the early date at which nervous phenomena appear. Several of the nervous phenomena have been regarded as the results of pressure, but they arise early in the disease before compression of nerves is possible. So frequent and prominent are nervous phenomena that the disease has been frequently diagnosed to be disease of the spinal cord. The early increase of patellar reflexes, the ankle clonus, muscular spasms, all show that the cord is involved. During the recovery stage after operation the rapid amelioration and even disappearance of the pains on movement and on pressure also indicate that the spinal cord is affected. Fehling's theory recognises the intervention of the nervous element, for he described the disease as a tropho-neurosis of the bone. But he considers it to be of reflex origin, and places the source of irritation in the ovaries. He says that after the results of Porro's operation and of castration, there can be no doubt that it is the pathological action of the ovaries which causes the softening of the bones. How, then, shall we account for those cases which arise after the ovaries and tubes, and even also the uterus, have been removed, and for those which occur in men? We shall leave out of account those which arise after the climacteric, because it might be said that, although the ovaries were obsolete in relation to ovulation, they might be the centre and source of some irritating process. To explain the existence of the disease in the former cases, either some other source of reflex irritation must be sought, or the origin of the disease must be located primarily in the spinal cord. The writer believes that, taking into consideration all the facts, the explanation must be sought in a primary affection of the nerve cells in the cord. The precise nature of the lesion we do not know; probably it involves

some of the large caudate cells in the anterior cornua. The lesion is not inflammatory; the rapid improvement which, in most cases, takes place after operation shows that it is not one of the gross organic lesions; it must, however, be of such a nature that it may be benefited by phosphorus and such measures as improve the general nutrition, because cases have occurred which have been so completely cured by the use of these remedies that they have afterwards withstood the usually unfavourable influence of the recurrence of pregnancy. Lowered vitality is generally associated with increased irritability and perversion of function. This sequence of events is frequently seen in relation to the cells of the cerebral cortex,—in certain predisposed individuals malnutrition is followed by increased irritability, excessive action, and perverted function of the cortical cells, as seen in several forms of insanity. The disease seems in anatomical characters to be allied to fragilitas ossium of advanced life, a disease in which the nerve cells are presumably in a condition of malnutrition. The cause of this malnutrition, whether some peculiarity of blood supply or some inherited peculiarity of nerve cell, must be of such a nature that the adjacent cells may also be affected, and so lead to other spinal symptoms. In osteomalacia there are points of resemblance to Charcot's disease, and also to that spinal condition which in locomotor ataxia leads to spontaneous fractures of bones. In the former disease there are observations which show changes in some of the large caudate cells in the anterior cornua, and in the latter disease there is evidence that the nutrition of the cells is involved. Both in osteomalacia and in locomotor ataxia the amount of callus produced after fracture depends upon the condition of general vitality of the system; in neither of them is the callus transformed into true bone tissue. An analysis of the affected bones in locomotor ataxia by Regnard shows a similarity to the results obtained in analysis of bones from osteomalacia. Inorganic constituents, 24 per cent. instead of 66; organic constituents, 76 instead of 33 per cent., largely composed of fat.

If we acknowledge that the cells in the cord which preside over the nutrition of the bones are in this disease in a condition of low vitality and increased irritability, the effect of reflex irritation from the ovaries or other organs at the menstrual periods and during pregnancy might be sufficient to aggravate or excite the disease, and prolonged lactation, damp, and other unfavourable hygienic conditions, by lowering the general nutrition, would affect also the nerve centres. If we recognise that the origin of the disease lies in the central nervous system, we afford a ready explanation of the endemic character of the disease in certain localities, because in no class of diseases is heredity so marked as in those of the nervous system. A particular example in this relation is furnished by Kehrer, who records the cases of a woman and her two sons being affected by it.

LITERATURE.

Without expressing any opinion on the relative merits of the papers enumerated in the subjoined list, it may be stated, for the benefit of those who wish to study special departments of the subject without perusing all the more recent literature, that they will find the pathological anatomy very fully described by Ribbert; a systematic account of the disease by Gelpke, Vierordt, and v. Winckel; recent clinical investigations by Fehling and Neumann; tables of cases by Truzzi, Gallia, and Kummer. Truzzi's Table is appended to this paper.

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Prof. Simpson said this was one of the most interesting papers that had been communicated to the Society for many years. It was interesting, first of all, because of the rarity of the disease with which it dealt. The rarity was so great in Edinburgh that he (Prof. Simpson) had never seen a case of labour in a patient with an osteomalacic pelvis, and besides the two cases which he had seen in consultation with Dr Ritchie, he had only seen one other patient with this disease. In her the condition that led her to seek advice was the difficulty of coition, induced by the narrowing of the pubic arch from approximation of the rami of the ischium and pubis. As to the case which Dr Ritchie had recorded so carefully,

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with the rapid improvement after operation. In the reports of cases it was remarkable to notice how pains that had existed for some months ceased a few days after operation, while in a week or two the patients were able to move in bed and then to stand or walk. He thought this rapid improvement was inconsistent with any lesion in the nerve cells of the cord, though not with trophic changes produced reflexly.

Dr Underhill thought that the Society and Dr Ritchie were to be congratulated on this excellent paper,—the most complete view and discussion of the subject in the English language. The disease was rare in this country, and he had not seen, or at all events had not diagnosed, one before delivery. The most interesting point was that of ætiology. It was clear that as the disease occurred in men as well as in women, there must be some other cause for it than ovarian irritation, as it did not seem to have been shown that there was any corresponding irritation in the male generative organs. He was reminded by Dr Murray of a case which occurred in Maternity where the uterus was ruptured, and the patient was treated by laparotomy and removal of the uterus and appendages, and recovered. In that case they found the pelvis beaked, but not much deformed, the general health broken down, and the tissues soft at the time of operation, and he had now no doubt that she was suffering from osteomalacia. This case went to prove the truth of Dr Ritchie's paper, because after her recovery the woman regained health and strength and youth in a very remarkable manner. The case was reported to the Society at the time, and published in the *Transactions*.

Dr Church thought that the fact of some cases of osteomalacia having been much improved by inhalations of chloroform gave support to the theory that the disease was due to the influence of micro-organisms. Chloroform being a germicide, and, on account of its rapidly diffusive power, getting easily into the blood, is most likely to act beneficially where organisms and their products are the cause of disease. *Apropos* of this subject, he mentioned the case of a little boy who suffered from some septic disturbance, with high temperature, for about three months, and who, after deep narcosis with chloroform, at once improved, and had no return of the symptoms. Also the case of a lady with acute peritonitis from septic causes, in whom chloroform inhalations had been kept up all night, and who apparently owed her life to that treatment. In osteomalacia due to organisms it was therefore reasonable to expect improvement from chloroform.

Dr James Ritchie said, in reply to Dr Barbour, that it seemed to him that the rapid improvement after operation showed that the disease was due to some influence from the central nervous system, and not to some zymotic or other general condition. The beneficial result, in a large number of cases, from the removal of the ovaries proved that they excited a powerful reflex influence through the

cells of the cord, but the fact that the disease persisted in a proportion of cases after double oöphorectomy showed that the cause originating the disease must be located in the cells of the cord. The lesion could not be, as Dr Barbour justly remarked, a serious organic change; probably it was lowered vitality with increased irritability. In relation to the remarks of Dr Underhill and Dr Milne Murray, friability of the pelvic tissues had been frequently noted. Fehling in some cases had difficulty in ligaturing the ovaries because of this friability.

V. ON A CASE OF ULCUS SERPIGINOSUM OF THE VULVA.

By A. H. Freeland Barbour, M.D., F.R.C.P. Ed.

The case which I wish to bring before your attention is of interest on account of its extreme rarity and the difficulties presented by its diagnosis. It has this further interest, that it was reported to this Society twelve years ago by Dr Angus Macdonald as a case of lupus. When the case came under my notice, the clinical characters of it were more suggestive of syphilitic ulceration, and the first microscopic examination seemed to bear this out. I should mention here that Dr Norman Walker saw the patient with me, and carried out the microscopic examination of the case. He submitted the preparations to Unna, the great authority on skin affections. Unna's opinion is, as we shall see, that it is not lupus nor syphilis. It shows most if not all of the characters of the rare affection which he has described as ulcus serpiginosum.

The patient, A. C., now aged 60, was married when she was 22 years of age, and after five years had her first child at full time, and healthy. She had subsequently seven other children, all at full time, five of whom are still alive and well. One died at three years of age, of scarlet fever; another at eighteen months, of bronchitis; and one at twenty-four hours after birth, of convulsions. She had two miscarriages,—one at the fourth month which occurred after her third confinement, and another at the fifth month after the sixth child. No satisfactory reason can be assigned for these two miscarriages. And it was their occurrence with some other facts that made me think the affection was possibly syphilitic. Her first husband died when she was forty-one; and some time after she fell over a cask and received a bruise on the genitals, which she says left a hard lump which persisted for months. Her doctor gave her an ointment which she used for some time without effect. At 44 years of age she married a second time, her husband being a sea-captain, to whom she had no children. A year after her marriage she first noticed a slight bleeding and discharge, which she thinks came from the lump, although she cannot be positive as to this. When she was

46 years of age she underwent the first operation under Dr Angus Macdonald, when the condition present was as follows:—

"Both labia majora, especially the left one, are abnormally large. At the situation of the anterior commissure there are two nodules, the one on the right being about half the size of a boy's marble, the one on the left about a third thereof in size. The smaller of these nodules is somewhat irregular in shape. Their colour is a deep rose, and their inner aspect where they meet is raw. On separating the labia majora, there is disclosed a considerable ulcerated surface from which there exudes a grumous fluid. The chief situation of the ulcerated surface is towards the posterior commissure, where it extends on each side to a distance of one inch and a half in breadth by three inches in length, the long axis of the surface being from before backwards. On deeply separating the labia, it is found that ulcerative action has destroyed almost completely both labia minora, their situation being occupied by two elongated ulcerated surfaces. Only the posterior portion of the left labium minus is very much hypertrophied and separated from the rest of the vulva by ulcerative action, so as to present a polypoid character. In the direction of the clitoris this ulcerative action burrows upwards to the extent of fully an inch. The feel of the ulcerated surfaces, as well as of their surroundings, wants that marked hardness characteristic of carcinoma. There is considerable hypertrophy of the tissues surrounding the ulcerated surfaces. The ulceration on the left side goes quite to the anus. On the right it leaves a portion of the perineum about an inch in length free. At no part does the disease ascend more than one inch up the vagina. The uterus and vagina are otherwise healthy, and there are no indications of enlargement, either of the inguinal or of the pelvic glands. Attentive exploration of the other organs revealed nothing unhealthy in the patient. The disease was diagnosed as lupus of the vulva. . . . That both labia were the subject of lupoid degeneration we have convincing evidence in the two microscopic preparations which Dr Chapman has made for me, and which I now show you. In them you will observe the peculiar large round cells of lupoid tissue lying in a matrix of connective tissue. You will also see in one of them the manner in which the actively proliferating epithelial tissue is throwing its arms around so as to embrace these bundles of round cells. Apart altogether from the clinical evidence, there is sufficient microscopical evidence to warrant a diagnosis of lupus, if that had been needed."

The diseased tissue was removed by gouge, scissors, and cautery, and the patient was dismissed cured three months subsequently. A year after this, however, the condition began to return, and progressed slowly. In three years her condition had become so aggravated that she sought advice at the Infirmary again, when she came under Dr Croom's care. He found both labia majora destroyed, and the ulcerative process had extended again back to

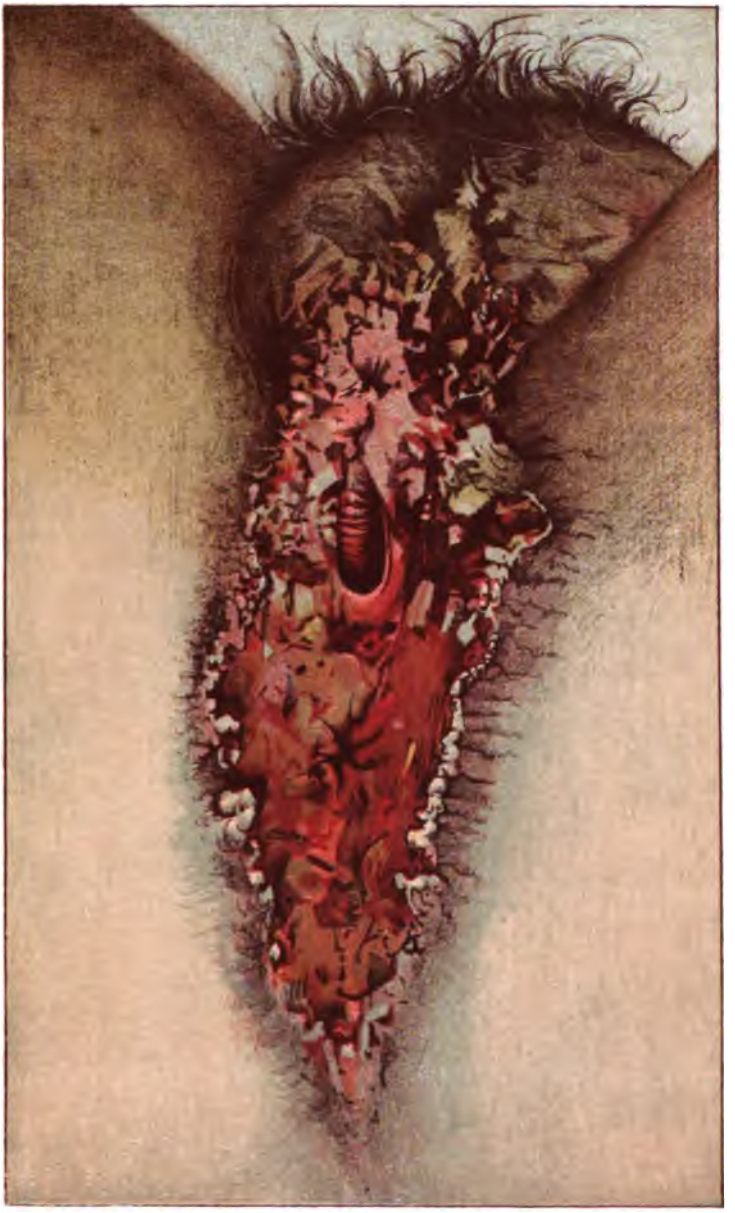
the anus. The greater portion was removed by the thermo-cautery in March and April 1887, and the patient dismissed much improved.

In August of last year, when I had charge of Dr Croom's ward, the patient again presented herself for treatment. The vulvo-anal was so much distorted by cicatrization after the previous operations and the progress of the disease that it is difficult to describe it. The accompanying Plate, drawn *ad naturam*, will give the best idea of the condition. The vulvo-anal region appears as an ulcerated surface covered with pinkish-red granulations. At the margins the skin is not undermined, but overhung by the new-formation. Into this raw surface the vagina opens as a contracted canal, admitting with difficulty the first joint of the little finger, while an inch further back, and completely surrounded by the raw surface (which extends back to the coccyx), is seen the anal orifice, into which only the tip of the little finger can be inserted. The diseased tissue was removed with the sharp spoon, portions being carefully excised for microscopic examination. To still further destroy the diseased tissue, an application of pyrogallic acid was made. In a month's time the raw surface had completely healed up, and perfectly clean scars taken the place of the raw surface. The patient left the hospital feeling perfectly comfortable, and says she has never felt better than at present. I saw her again a week ago,—that is, four months after the operation,—and was sorry to see that the disease is again showing itself at the upper left margin of the cicatrized surface, and also behind on two opposed surfaces near the anus.

The microscopic characters of the growth are given by Dr Walker in the following report:—

"Before entering on the pathological report I may be allowed a very brief clinical remark. When Dr Barbour asked me to see the case I was naturally very much interested, for the cases of Angus Mac-Donald and Matthews Duncan are quoted in all the text-books of dermatology, and usually referred to as cases of mistaken diagnosis, lupus having been diagnosed instead of syphilis. Clinically, the case was not one which would come under the category of lupus as recognised by the dermatologist, for, except the serpiginous extension, there was nothing characteristic of tuberculosis of the skin. My impression of the condition was that it was more probably malignant and of the rodent ulcer class, although there were characters not altogether in accord with that diagnosis. On examining sections which were made through the advancing edge, and this included a portion of the healthy skin as well as a portion of the ulcer, the most remarkable feature was a striking areation of the growth. A glance was sufficient to show that the condition was not tubercular, and a very brief examination to show that it was not cancerous. The edge was everted in a way common to many ulcers of the skin, and the surface was covered with a

For Dr Barbour's Paper



ULCUS SERPIGINOSUM VULVAE

mixture of blood and pus. The striking feature already referred to was the presence of sections of peculiarly shaped cells especially collected around the vessels. These were separated from each other by perfectly healthy tissue, and are distinctly larger than ordinary leucocytes. When carefully stained they are found to have a tendency to a square shape, and to stain with methyl-blue in the manner which Unna describes of his plasma cells, which are practically what we understand by epithelioid cells,—namely, connective tissue derivatives. Exceptionally, giant cells occur, but these are not of the type of tubercular giant cells. They have a ring of nuclei, and are in all probability derived from the obliteration of a lymphatic vessel. The connective tissue between these areas is distinctly more cellular than normal, the spindle-shaped neuclei are very distinct and larger than normal, and there are many rounded cells among them. Mast cells are present in considerable numbers throughout the connective tissue. The specimen is unlike any that I have previously examined.

"Similar collections may occasionally be seen in cases of tuberculosis, but they are never so evenly distributed throughout the cutis as here. The ulceration is due to the enormous proliferation of these cells cutting off the blood-supply of the surface. Tuberculosis and carcinoma being easily excluded, the question arises, What is the nature of the growth? I was at one time inclined to believe it to be syphilitic, on account of the localization around the bloodvessels. But Dr Unna, to whom among others I submitted specimens, very rightly pointed out that while that might possibly have held in a recent case, that the history of this one was incompatible with that diagnosis, for had the disease been syphilitic it must have been a red tertiary lesion, and there would have been evidence in these areas of some degeneration, which there is not. The other idea, which was suggested by Mr Stiles, was that the growth was possibly endotheliomatous. With this, however, I am not inclined to agree, as it appears to me that the growth is, if anything, rather from the outer than the inner aspect of the vessels. It then occurred to me that the disease corresponded to some extent with the condition described by Dr Unna in his book as ulcus serpiginosum, and I therefore sent him some sections for his opinion. He replied that, so far as he could see from the section, it was quite possible that it was so, and pointed out certain conditions which were necessary to establish the diagnosis. These were, that the disease should extend along and undermine the healthy edges, which this most distinctly does; that the bacilli which I had found when using the methyl-blue stain should be found at the advancing edge; that they should lose their colour when treated with iodine (Gram's method), and stain better in methyl-blue than in the other aniline colours. So far this test has been successful, that the reactions are as he describes, but I have not been able to demonstrate them in every section at the

advancing edge of the growth. I am, however, inclined to regard the growth as of this nature rather than of an endotheliomatous one. The bacilli which I have found correspond very well to Unna's description,—that is to say, they are short bacilli, which are present in chains."

The condition referred to by Dr Walker is thus described in Dr Unna's book on Dermatology. I quote from Dr Walker's translation :—

"The serpiginous chancre is a form of ulcer commencing in the genital region, and in the course of months and years extending in a perfectly concentric manner over a great part of the neighbouring regions of the extremity; it is completely different from the spontaneously healing ulcus molle, although at the commencement it is not easy to distinguish from it. While in the soft chancre a centripetal healing takes place, in the serpiginous this is centrifugal; the infectious agent in the one case gradually loses its activity, but in the other only at the affected part, while it continually attacks fresh tissue at the periphery, and deeply undermines it. The extending marginal part of the serpiginous chancre always possesses, therefore, an external, deeply undermined border, and an internal one gradually passing into the scarred centre. The former is firm, and thicker than in soft chancre. The losses of substance run like mines, downwards and horizontally, often radiating from one point of the periphery, so that the latter, cut out like a tongue, remains for a time before becoming ulcerated. Then follows everywhere the scarring, but it is often not complete, so that the central scar again breaks down in many places, and new undermining may again take place. The secretion is less, and much less infectious than in ulcus molle, so that only rarely multiple circles of the serpiginous chancre are present; where they meet they directly run together. The ultimate scar is firmer than in ulcus molle."

No literature on the condition is given, and Dr Unna's description is based upon one case of his own and two of Dr Lauenstein's. Of the extent of surface involved in these cases he says :—"In one the chancre included the genitals, and with the second circle the upper part of the thigh. In another, in addition to the genitals and the right thigh, a great part of the skin of the abdomen; in my case the skin of the scrotum and the pubic region was mainly destroyed."

Of its microscopic characters he says :—"Now it is an invariable appearance in serpiginous chancre, and explains its extension, that the necro-biotic marginal zone sends processes towards the left into the middle of the young plasmoma, or, as miners say, horizontal galleries from the perpendicular shaft. In that gallery, which runs parallel or somewhat obliquely outwards to the surface at the left side of the chancre, one invariably finds numbers of the bacilli, which may well be recognised as the cause of the serpiginous

chancre, while on all the other parts of the much ulcerated surface they are only occasional or altogether absent. They lie in long twisted chain, more rarely in packets, and are never enclosed in cells."

Again he says:—"From their constant presence in the most important parts of the serpiginous chancre, I regard this chained bacillus as the actual cause of the disease."

I have put under the microscopes sections showing the general structure of the growth, and the bacilli which Dr Unna considers to be the actual cause of it.

Dr Norman Walker said the case was most interesting. The cases of Matthews Duncan and Angus Macdonald were alluded to in most works on dermatology, usually as instances of mistaken diagnosis. Lupus he was able to exclude whenever he saw the case, which he thought was probably of the rodent ulcer type, though not exactly like that condition as it occurred in other regions. Under the microscope it could not be identified with any growth with which he was familiar. Syphilis, which its localization round the vessels indicated, was excluded, for as Unna, to whom he sent some sections for opinion, pointed out, there were no signs of degeneration, which in such a long-standing case could not have been absent. Although he was unable to demonstrate the bacilli in every section, he was inclined to agree with Dr Barbour in the diagnosis of ulcus serpiginosum, and to attribute the absence of bacilli to faulty methods. He thought Dr Barbour had not made it sufficiently clear that Unna's ulcus serpiginosum was closely allied to the soft chancre. The history of the case was distinctly suggestive. He thought that if gynæcologists knowingly used the term "lupus" to all sorts of ulcerative processes, whether tubercular or not, the sooner they stopped doing so the better.

VI. BRAUNE'S OS INTERNUM AND THE RETRACTION RING.

By A. H. Freeland Barbour, M.D., F.R.C.P. Ed.

The Venezuela frontier question has not given rise to more discussion than the delimitation of the area of the body of the uterus in labour. The story of the dispute with Venezuela goes back to the map on which Schomburg drew his now famous line. The discussion which has gone on for five and twenty years round the disputed area in the lower portion of the uterus goes back to Braune's classical section, and a line on it which he labelled the Os Internum. Like the old map, this section has raised a dispute which it is powerless to settle. Braune himself has said[1]—"That

[1] Sänger—*Ein letztes Wort sur Cervixfrage*, quoted by Doderlein in *Die Ergebnisse der Gefrierdurchschnitte durch Schwangere*: Wiesbaden, J. F. Bergmann.

he could not recall all the particulars which led him and Schatz to mark the line in question *orificium uteri internum.*" No microscopic examination of the tissues was made, and the soft parts had to be destroyed so as to construct the bony skeleton.

It is not my intention to follow this discussion through its various phases up to the solution which Schroeder has given, that the ring which Braune called the os internum marks the lower limit of the active contracting portion of the uterine wall, and not of the uterine cavity. That is to say, that the os internum lies in Braune's section, not where he indicated, but at some point in the territory below.

It seemed for a time as if Schroeder's delimitation had settled this frontier question. But the text of Zweifel's Atlas[1] and Doderlein's more recent article, which I have already referred to, show that it is still a *quæstio vexata.* This is one reason for my opening the question here. Another reason is that Dr Webster and I have never published the microscopic evidence which led us to describe the prominence in the muscular wall of the uterus in our section as the retraction ring, and the subsequent examination of which allows us to define approximately the os internum.

In this paper I shall first criticise the statements of Zweifel and Doderlein, and then give the anatomical data as regards our own section.

Zweifel's two sections from ruptured uterus and placenta prævia form the first demonstration we have had of the genital tract dilated throughout, from fundus to vulva, the child being in both cases partially born. I described these sections in a former paper, and here restrict myself to the point in question.

The section from a case of placenta prævia[2] is the most significant, and in the text he says: "The situation of the os internum is in the second preparation fixed easily and with great certainty. It is the fold which runs at the level of the promontory towards the anterior abdominal wall. A large vein is not present at this place. But the determination of the os internum from the position of the so-called circular vein of authors must be given up, since Braune himself has revoked his former view that at this point, as a rule, there lies a large vein running round. Also the attachment of the peritoneum is of no value in this second preparation. So much more certain as a guide is the microscopic examination of the mucous membrane. Above the ring, which is plainly seen, is decidua; below it, cervical mucous membrane. Up to this ring there are attached on the right side of the body the membranes. The os internum was traversed without difficulty in turning. The

[1] *Zwei neue Gefrierschnitte Gebärender*, von Dr med. Paul Zweifel, Leipzig, 1893.

[2] Reproduced in the *Atlas of the Anatomy of Labour*, third edition, plate xxvi.

os externum remained long undilated, apparently on account of a rigidity, the patient being a primipara, aged thirty years."

In the genital tract from the case of rupture of the uterus, Zweifel does not mark the os internum. The text runs as follows:—"The situation of the os internum must, in the first preparation, be determined by the attachment of the membranes. The distance from the os internum to the os externum measures, in the mesial section on the anterior wall, 75 mm. If we measure the same distance on the posterior wall from os externum upwards, we come to the seat of the tear. So that this occurred at the transition from the os internum to the musculature of the body."

In the section of the text on "The Lower Uterine Segment and the Cervix during Labour," he says in reference to the discussion as to whether the cervix could stretch to the extent indicated in Braune's section: "The two new frozen sections give microscopically quite sufficient and infallible proof that such an enormous stretching of the cervix is possible, and is present as a matter of fact in both preparations." Of Schroeder's view he says: "This view can no longer be maintained. What he has described as the contraction ring is not only the os internum of Braune, but the actual true os internum of all anatomists and obstetricians."

All we can do with these sections and the text before us is to return a verdict of not proven. We infer from the text that the microscopic examination was only made in the second case, and the facts mentioned as to the attachment of the membranes are a very strong evidence that this ridge cannot be the os internum. Before labour the membranes are attached up to that point, but during the first stage they become separated to the extent necessary to form the free bag of membranes. Chiari gives the amount of the separation as about 4 cm. on the anterior wall—that is to say, the line of attachment of membranes is 6·5 from the os externum, of which 2·5 was covered with cervical epithelium, the remaining 4 cm. with decidua. It is therefore evident that the os internum must lie some distance below the line of attachment of the membranes. In the placenta prævia case the hand was passed into the uterus, so as to turn and extract the child, which would further detach the membranes. So that against the fact of cervical epithelium below the ridge which Zweifel calls the os internum we must set his statement that on the right side the membranes were attached up to this region. With regard, therefore, to the demonstration from these sections that the ridge in question is os internum, we return a verdict of not proven.

Doderlein keeps the question of os internum *versus* retraction ring specially before him in his very interesting review of the results obtained from frozen sections. Speaking of Braune's section, he says: "How much trouble and time would have been spared, how much quarrelling avoided, if only a single microscopic

section could have been made of the part of the uterus below the much disputed Braune's os internum." After referring to what Sänger says, and Zweifel's statement that Braune kept to his position that that really was the os internum, and was embittered because of the want of belief in this assertion, he says that "the only fact that remains is that Braune did not fix his os internum on grounds which are to-day considered valid."

In speaking of Chiari's section, and apparently admitting the correctness of Chiari's demonstration of the os internum for his own section, he says: "The whole demonstration given by Chiari from this preparation, against Braune's view of the os internum, appears untenable, because there is no proof that the point marked + in Chiari's preparation corresponds to that which Braune calls the os internum." He says, further, that no importance can be attached to the presence of the veins, that the folding of the membrane is an accident, and that the spirit-hardened preparations show no marked thickening at the os internum. From these considerations he concludes that "Chiari's section in no way proves that in Braune's section the os internum is wrongly given, and that this section of Chiari's is of no value as to the question of the origin of the lower uterine segment, and for the existence of a contraction ring."

To these conclusions it may be replied that Chiari does not use the presence of the vein to mark the os internum, but to aid in the identification of similar places in the uterus described by him, and that by Braune. Large veins may or may not be seen in a section of the uterine wall, but when present they are one of the many signs marking the commencement of the body of the uterus proper, in contradistinction to the lower segment. Doderlein was right in saying that there is no marked bulging of the muscle in Chiari's as there is in Braune's section. But this just amounts to a statement that a retraction ring may or may not be present. He does not give Chiari full credit for the absolute demonstration that whatever happened in the case from which Braune's section was made, in the one from which his preparation was taken the cervix only elongated to a little more than 2 cm. And, looking at the thickness of its walls, one does not see how it could possibly have stretched to five times that extent,—that is, to the 11 cm. of Braune's section.

Commenting on Schroeder's first stage section, Doderlein suggests that the swelling and thickening of the uterine wall, which Schroeder calls the contraction ring, may be due to the curvature of the wall round the pubis, and questions the existence of a contraction ring in this specimen. But he apparently admits it for the section post-partum, because in referring to the measurements of the uterine wall he says: "These are very important figures which for this puerperal uterus appear entirely to justify its division into three parts—body, cervix, and lower segment between them."

Referring to my own sections and those made along with Webster, he says that what Braune took to be os internum I describe as contraction ring, and that I could not find the seat of the os internum, because I did not examine the tissue microscopically. "On this omission the value of the preparation is wrecked. . . . . This is the more to be pitied, as this very preparation would have been of great significance in giving evidence on this point." The text of our paper runs: "The os internum cannot be accurately placed, the parts *not* having *yet* been *examined microscopically.*" Also, I have called the swelling of the uterine muscle not contraction, but retraction ring. The reason for this I shall give after a description of the microscopic sections.

Results of the Examination of the Microscopic Sections.

When examining the marks in the cavity of the uterus, after the fœtus has been removed from a frozen section, we must remember that the plastic uterine wall moulds itself to a certain degree on the irregularities of the fœtus. It is interesting in this connexion to compare the behaviour of the uterus in the first stage with that in the second. We may say, generally, that while the first stage uterus tends to mould itself on the surrounding structures—spinal column and bony pelvis—the second stage uterus tends to mould itself on the contained fœtus. This is due to its plasticity, and may be also in part a post-mortem change. Bulging of the uterine muscle, therefore, in the cavity must always be scrutinised in its possible relation to depressions in the fœtus. But after due allowance has been made for this, we find certain prominences of the uterine wall that cannot be thus explained. Take, for example, this section of the posterior wall of the uterus from our second stage case. Gradual hardening in spirit tends to remove the adventitious thickening from unequal pressure of the fœtus. We see here a sudden transition from the thick to the thinner portion of the uterine muscle, and it is interesting to note that the membranes are attached down to this thickening, but below it are separated. Beneath the point of separation fragments of them are present, and still lower down portions of cervical glands which are most numerous at the fold representing the posterior lip of the cervix. Below this we find vaginal epithelium. In the absence of the surface epithelium of the cervix, it is impossible to say precisely where the os internum lies. All we can say is, that it must be above the place where the cervical glands are seen, and where fragments of membranes are found. It must also lie at a certain distance below the line of attachment of the membranes, that distance corresponding to the surface of membranes which became free to form the bag of membranes in the first stage.

Comparing now the microscopic section[1] with the frozen section,

[1] See Plate xxiv. of the *Atlas of the Anatomy of Labour as Exhibited in Frozen Sections*, third edition.

we find that the bulging in the former is at a shorter distance from the os externum than in the latter. I do not think that this can be accounted for by the shrinking of the parts in alcohol, but that it means that the thickening which I have called retraction ring should really be marked a little lower than appears in the frozen section, and that the bulging in the latter is in part due to the inequality of the surface of the child. I have intentionally indicated in the figure a *region* of the os internum, as I do not think that in frozen sections we can expect to define it with the same precision as in the pregnant uterus. When we consider how the cervix is stretched and lacerated, and how its bruising must tend to destroy the surface epithelium; and, further, how the freezing of the fresh tissues breaks them up, and the thawing while the drawings are being made macerates the tissues, we cannot expect very precise results from microscopic examination. Still we get sufficient to justify our saying authoritatively with regard to this case that the posterior wall shows a sudden increase in its thickness at or a little below the point marked in the frozen section as the retraction ring; that the membranes are adherent down to it; that this point is not the os internum, but that the latter lies in the region indicated, and that the cervix has stretched vertically not more than 1·5 in.

The examination of the section of the anterior wall shows that the membranes are adherent down to the point indicated in the figure. The area still higher up, over which they are absent, corresponds to the placental site. Below the line of their attachment we find that the uterine surface has only shreds of them on it here and there, and only lower down do we come on fundi of cervical glands. The plate-like arrangement of the muscular fibre at the point indicated in the figure is another proof that here we have still to do with lower uterine segment, the texture being quite different from that in the cervix, the bundles of which are separated by fusiform spaces containing connective tissue.

A microscopic examination, therefore, of this section justifies the assertions with regard to it that there is a retraction ring, that the os internum lies at a distance below, and that the cervix is only from about 1·3 to 1·7 in. long.

Retraction v. *Contraction Ring.*

As regards the name given to this thickening of the uterine muscle, retraction ring is a much more accurate and suggestive term than contraction ring. Further, it is wrong to look for it in the pregnant uterus. All we find there is a suggestion as to *the place where it will probably develop when retraction has occurred in labour.* The term retraction ring suggests its nature better than contraction ring. Contraction is temporary, and will only be found in a frozen section in which the patient has died during a pain. Retraction is permanent, and will always be registered in a frozen

section. Further, it is to retraction that its clinical significance belongs. It is to the fact that one portion of the uterine muscle has become permanently shortened and thickened at the expense of the lengthening and thinning of the part below it, and the consequent risk of rupture in the same portion, that this change in labour comes to be of importance, as was first pointed out by Bandl.

MEETING VI.—MARCH 11, 1896.

DR A. BALLANTYNE, *President, in the Chair.*

I. THE following gentlemen were elected Ordinary Members of the Society:—R. W. Beveridge, M.B. C.M., 9 James Place, Leith, and John Anderson, M.B. C.M., Pitlochry.

II. *Dr Milne Murray* showed TWO VELAMENTOUS PLACENTÆ.

III. *Dr J. C. Kynoch,* Dundee, showed a specimen of HYDROSALPINX removed from a woman, æt. 38, on account of pain in left side, especially on movement of the bowels. There were delicate adhesions to the rectum. The corresponding ovary was enlarged, and showed in the cortical part two small cysts with sebaceous contents. The opposite tube and ovary appeared to be unaffected.

IV. *Dr J. W. Ballantyne* showed—(*a.*) Frozen sections of an infant with CONGENITAL DIAPHRAGMATIC HERNIA. The confinement, which took place in January, was under the care of Mr Young, one of the Medical Mission students at the Cowgate. The infant, a female, was full time, had presented in the usual way, and had been born without instrumental aid. The child was large, well formed, and apparently healthy, but it was still-born, and although it made efforts to breathe for fifteen minutes, it could not be resuscitated. Dr Graham, the Resident at the Cowgate Dispensary, began to make an autopsy, but found on opening into the thorax that some coils of intestine lay in the left pleural cavity; he accordingly, diagnosing a malformation, closed up the wound again and communicated with me. I decided to freeze the specimen and make a coronal section, as being the method best calculated to show the displacement of the viscera. Accordingly, a coronal section was made, passing through the shoulder joints above and the hip joints below. It was then seen that the left side of the thorax was entirely filled with abdominal viscera. The diaphragm was muscular and perfect on the right side, so was it also on the left side posteriorly; but anteriorly, in the position usually occupied by the pericardial attachment, muscular fibres were absent from the diaphragm, which projected upwards as a membranous sac, entirely filling the left half of the thoracic cavity. This sac contained the left lobe of the liver, a large loop of meconium-distended

colon (doubtless the transverse), the whole stomach, and a great many coils of small intestine. The heart, in the pericardial sac, lay entirely in the right side of the thorax, the right lung lying quite unexpanded behind it. During its displacement the heart seems to have been rotated as well as pushed to the right, for the left ventricle lay anteriorly, and the right behind it. The thymus gland was situated in the apex of the right side of the thorax. At first sight no left lung was visible; but a careful search revealed it, very small in size, measuring barely one inch in its vertical diameter, lying in the apex of the thoracic cavity a little to the left of the median line and in close contact with the upper loop of colon, but separated from it by the diaphragmatic sac. The drawings fully showed the relations of the other viscera. The section had, unfortunately, passed between the uterus and bladder, so that neither was well shown. The left kidney and supra-renal just came into the line of section, the right kidney and adrenal lying posterior to it. Probably the drag of the displaced organs on the left side had drawn the corresponding kidney and adrenal forwards. This, therefore, was a case of congenital diaphragmatic hernia due to distension of the fibres of the diaphragm on the left side and anteriorly, leading to the displacement of the abdominal viscera into the left side of the thorax, the dislocation and rotation of the heart to the right side, and arrested development of the left lung. The starting-point would seem to have been a defect in the muscular construction of the diaphragm.

(*b.*) Three cases of ANENCEPHALY. The fœtuses were all females. The first had been sent to him by Dr James Smith of Falkirk. It showed anencephaly with a spinal canal closed as high as the cervical region. It was the product of the fourth pregnancy: the first child died at three months from jaundice (?); the second (a female) is still alive; the third was an abortion. In this instance the head presented, and there was tremendous hydramnios. There was no family history of hydrocephalus on either side. The second specimen, received from Dr James Harvey of 7 Blenheim Place, was also anencephalic, but in it the spinal canal was open in its whole extent. The labour was under the care of a midwife, and was tedious, so that Dr Harvey was called in. The head presented, and as there were no pains, the child was delivered with forceps. The third fœtus closely resembled the first, for it was anencephalic, and had yet the spinal canal closed as high as the level of the neck. It had been sent to him by Dr Frank Dendle of Lochgelly. The mother, a i.-para, 22 years old, was between the seventh and eighth months of pregnancy when labour came on. The fœtus presented by the breech, and was delivered without instrumental aid. The mother's mother ascribed the malformation to a too active interest which the mother had taken in a neighbour's child that suffered from spinal caries. There does not seem to have been hydramnios in this instance.

V. *Prof. Simpson* showed—(*a.*) A FIBROID TUMOUR the size of an adult head, which he had removed the day previously from a patient, 35 years of age. The tumour had been growing rapidly, and he had opened the abdomen in the hope that it might be a case favourable for hysterectomy according to the procedure advocated by Dr Christopher Martin at a recent meeting of the Society. Some masses, however, were found to be impacted in the pelvis, and after removing the subperitoneal masses now exhibited, he had to content himself with the removal of the left tube and ovary, and on the right side only the tube could be removed, the right ovary being bound down in the pelvis. He (Prof. Simpson) had had a series of nine cases of uterine fibroids in his ward during the last year, where removal of ovaries and tubes had been attended with the most satisfactory results.

(*b.*) AN OVARIAN TUMOUR removed from a patient, whom he had been called to see in the country eighteen days ago, suffering from an intense degree of peritonitis. The abdomen was greatly distended and tympanitic; there was distinct fluctuation in the flanks, and a somewhat solid mass could be vaguely felt in the right iliac fossa. The pulse was rapid, and it was clear that unless the abdomen was opened the patient must soon have died. The cavity was found to be largely filled with a dark gelatinous fluid stained with blood which had escaped from an ovarian tumour which had burst. The tumour was removed, the cavity sponged out, and afterwards irrigated with a boric acid lotion. A drainage-tube was introduced and the wound closed. The patient was very much collapsed just after the operation, but she gradually rallied, and has been making a satisfactory recovery.

OVARIOTOMY UNDER LOCAL ANÆSTHESIA.

Prof. Simpson said—Some months ago, having occasion to tap a patient in the country who had long suffered from uterine fibroids, and had latterly become much distressed from ascitic distension of the abdomen, I injected 20 drops of a 1 per cent. solution of cocaine into the wall, through which I pushed a bistoury to make an incision large enough to admit the finger. The incision and the subsequent introduction of the stitches caused no pain.

Some weeks ago a patient was sent to my ward suspected to be the subject of an ovarian tumour, but who was recognised to be suffering from tubercular peritonitis. In that patient Dr Webster, by the injection of a cocaine solution and the application of an ethyl chloride spray, was able so to anæsthetize the abdominal wall that an incision was made long enough to allow of evacuation of the cavity and exploration of the pelvis without causing the patient any suffering.

In February, C. C., a young unmarried woman, aged 20, of

girlish appearance, was admitted to the ward with an abdominal swelling. Her menstruation had begun at the age of 14½, of the 28-day type, and moderate quantity, and continued regularly up till a year ago, when for two or three times it came on every fortnight, attended with dysmenorrhœa. Latterly it has resumed its normal characters. She first noticed a swelling in her right side when she was fifteen years of age. She had previously menstruated six times naturally and painlessly. The swelling increased steadily in size, but slowly, for four years. During the last twelve months it has grown more rapidly, and the patient experienced a sense of weight in the abdomen. The tumour was clearly ovarian, and on examination under chloroform the uterus was found on bimanual examination to be retroverted and pushed down into the pouch of Douglas, while the tumour sprung from the right side and was freely movable. As the conditions gave every prospect of an easy ovariotomy, I thought it fair to attempt the operation under local anæsthesia. On March 6, the patient having been subjected to the usual preparatory treatment, I injected 20 ♏ of a 1 per cent. solution of cocaine into the abdominal wall, nearly midway in the middle line between umbilicus and pubes, and the same quantity two inches lower down. After the fluid had been diffused through the tissue, the surface was sprayed with ethyl chloride till it took on a frosted appearance. An incision three inches in length was carried through the abdominal parietes in the anæsthetized area. The muscles showed a slight degree of sensitiveness when some fibres of the rectus were divided, and the patient seemed to feel when the peritoneum was pinched up with forceps. An incision into the main cyst allowed of the evacuation of the bulk of the tumour contents, and when a subsidiary had been perforated through the opening in the larger cavity, the tumour collapsed sufficiently to allow of its being easily pulled out through the wound. So far the operation was practically painless, and the patient lay perfectly still and uncomplaining. After the pedicle of the tumour, however, was pierced with an Olshausen's needle, and when the ligature was being tied, she screamed and began to struggle. Just here special difficulty arose from the circumstance that the ligature first introduced broke in the tying, and each time the stronger ligatures were being tightened at the two sides of the pedicle there was the same expression of suffering. When the pedicle was nipped with catch-forceps on the distal side of the ligature, and when the tumour was being cut off, and again when a mass ligature was being secured round the stump, the patient cried out and wriggled to a degree that caused some delay. Dr Keppie Paterson, who has been in the habit of kindly chloroforming our cœliotomy cases, was standing in his usual place at the patient's head, screening her face and watching circulation. He recognised, whilst the pedicle was being dealt with, that there were distinct symptoms of collapse, which led him

to give her a hypodermic injection of ether. A flat sponge was, as usual, introduced behind the wound, which was closed with a double layer of sutures. The buried layer consisted of three chromicised catgut sutures, which brought together the fascia and peritoneum; while four silk sutures passed alternately with the catgut sutures through the whole thickness of the wall down to, but not through, the peritoneum, secured the external surface of the wound. The passing and tying of the sutures was effected painlessly, the only expression of suffering emitted by the patient occurring when the sponge was being dragged out of the abdominal cavity. It gave us again the impression that the peritoneum was extremely sensitive. The patient was remarkably free from pain afterwards, and had no sickness or other discomfort. There was a slight rise of temperature in the evening, which fell again by the next morning. She went on favourably, and had the bowels moved on the third day by a saline aperient. That day the temperature again rose, and on the morning of the fourth day Dr Chipman, Buchanan Scholar, in charge of the ward, noticed a scarlatinal rash making its appearance first on the arms and chest, and in the course of twenty-four hours she was seen to be the subject of a smart attack of scarlatina, with the rash all over the body, inflamed fauces and strawberry tongue. The wound remains healthy, and there is no tympanitis.

The operation was a simple one; but even in such another case I would prefer to have the patient chloroformed, for the occasional after-sickness to which the chloroformed patient is liable is more than counterbalanced by the pain to the patient of securing and severing the pedicle, the tendency to collapse that then arises, and that is averted by a full narcosis, and the disturbance to the operators by the patient's screams and struggles.

VI. PUERPERAL PULMONARY THROMBOSIS, WITH AN ILLUSTRATIVE CASE.

By J. Lamond Lackie, M.D., M.R.C.P.E.

Mr President and Gentlemen,—Rapid death occurring in the puerperium may result from various causes, such as from continued exhaustion following post-partum hæmorrhage, from rapid septicæmia, from cerebral embolism, or from pulmonary thrombosis, but these cases must be distinguished from those in which death is really sudden, coming on with a lightning-like stroke, without a moment's warning, while the patient is apparently perfectly well. This *sudden* death may occur under various circumstances, the most important of these being from syncope, the entrance of air into the uterine veins, pulmonary embolism, or from pulmonary thrombosis. No doubt pulmonary embolism, in which the clot has travelled from a peripheral vein, is the commonest of these, but so long ago as 1849

Dr Meigs first pointed out that primary thrombosis in the right ventricle or in the pulmonary artery, or in both, might occur, and prove a cause of sudden puerperal death. Since then several important papers have been written on the subject, the most exhaustive being those of Barnes and of Playfair. The latter made a careful analysis of twenty-five cases of sudden death after delivery in which accurate post-mortem examination had been made, and in fifteen of these he attributed death to pulmonary thrombosis. I am well aware of the existence of the excellent paper on this subject which Dr Church read before the Society four years ago, but since my case in many respects differs very markedly from his, I venture to report it, even at the risk of repeating much that has been better said by him. Dr Church's patient lingered for three days after the onset of symptoms, while mine was one of sudden death; and since so very few cases of this terrible complication of the puerperium are recorded, I feel justified in bringing before the Society the record of one of which I had charge some time ago.

Mrs K., a strong, healthy, somewhat stout primipara of 26, was confined of her child on February 27, 1892. During pregnancy she enjoyed good general health, but during the last few weeks of gestation anasarca of the lower limbs was so great that she was obliged to spend most of her time in the recumbent position. The urine was examined occasionally, but at no time was there the slightest indication of albuminuria.

The first stage of labour was practically painless, and when I was called at 5 P.M. I found the membranes ruptured, the os fully dilated, and the head in the L.O.A. position well down in the pelvis. Within an hour the child was born by natural efforts, and the placenta, which was normal, was expressed with ease twenty minutes later. It is important to note that there was lost during the labour and post-partum an unusually small quantity of blood. This I remarked at the time to the nurse in attendance.

The patient had a perfectly normal puerperium. Except for a slight rise of temperature on the third day, due to the development of the mammary function, there was no fever, and her pulse, so far as I observed, never rose above the rate of 80 per minute. On the eleventh day she was lifted on to a couch, where she lay for an hour and a half, and then she seemed perfectly well. On the twelfth, at 3 P.M., she got up and walked from the bed towards an easy-chair at the fireside, a distance of about 12 feet. Just as she reached the chair she exclaimed that she was dying, complained of excessive shortness of breath, and instantly collapsed on the floor. Her face became livid, she struggled for breath, but very speedily became unconscious. I was with the patient within six minutes of the onset of the illness, but on my arrival she was just dying. The extreme lividity of her countenance was most marked; she had no pulse at the wrist, and gave no signs of life except an occasional effort

at respiration. Ether was administered hypodermically and other restoratives applied, but the patient died within two minutes of my entering the house.

A post-mortem examination was made on the subsequent day, and this revealed the following facts:—The uterus was normal in size, the fundus being just above the brim of the pelvis, but it was somewhat flabby. The cavity was normal and quite aseptic. There was no indication of clotting in the veins of the pelvis, nor in the femoral veins, at least in their upper part. All the organs of the body seemed healthy, but on opening the pulmonary artery there was found a thrombus, white, dense, and fibrinous, adherent to especially one side of the vessel, and extending into both branches and their ramifications for some distance. On the surface of this clot there was more recently coagulated blood. The right ventricle of the heart was also occupied by a recent dark purple clot.

This condition of pulmonary thrombosis I considered the cause of the death of the patient.

It is interesting to note that there were absolutely no premonitory symptoms to lead one to anticipate the awful catastrophe which occurred. The patient had a normal labour, and apparently a normal puerperium up to within six minutes of her death. The œdema of her legs had entirely disappeared, and there were no complaints of symptoms which would lead one to suspect thrombosis in any peripheral veins or in the large vessels of the thorax.

The question naturally arises—Was this a case of embolism or of primary thrombosis?

Some authorities, especially Virchow, hold that primary thrombosis of the pulmonary arteries is a mechanical and physiological impossibility, and attribute all obstructions to the circulation in these vessels to the transference of a clot from some portion of the peripheral venous system. The embolism in such cases either actually blocks the artery or gives rise to a nucleus round which deposition of fibrin takes place. Virchow holds that the primary factor in thrombosis is stagnation of the blood current, so that the impulse impacted by the action of the heart is sufficient to prevent coagulation taking place, and he further believes that the only condition which gives rise to pulmonary thrombosis is some obstruction to the circulation in the lungs, such as that which occurs in emphysema.

On the other hand, Benjamin Ball thinks that it is quite possible that spontaneous coagulation may occur, at least in the smaller branches of the pulmonary artery, just as in peripheral veins; while Barnes, Humphry, and Playfair affirm that under certain conditions it may occur in even the main vessel and its larger branches. Dr Humphry says:—"The artery breaks up at once into a number of branches, which radiate from it at different angles to the several

parts of the lungs. Consequently a large extent of surface is presented to the blood, and there are numerous angular projections into the current, both of which conditions are calculated to further the spontaneous coagulation of fibrin."

These authorities believe that cases of sudden pulmonary embolism and of pulmonary thrombosis can be differentiated clinically, not so much from the actual symptoms, which are practically identical in the two conditions, but rather from, especially, the date of the occurrence of the fatal issue, and the presence or absence of the signs of peripheral thrombosis. They have pointed out that, whereas in the case of embolism the symptoms come on late in the puerperium, in most cases after the nineteenth day—that is to say, when the peripheral thrombus has begun to soften and break down—primary pulmonary thrombosis corresponds in its date of occurrence with the date at which primary peripheral coagulation usually occurs,—that is, between the eighth and the sixteenth day, but sometimes as early as the second or third.

In all of the fifteen cases collected by Playfair, with one exception death occurred before the fourteenth day. Further, he has observed one or two cases in which, after distinct signs of pulmonary obstruction have shown themselves without proving immediately fatal, peripheral thrombosis, in the form of phlegmasia dolens, has commenced. In such the peripheral lesion is followed by, or is coincident with, the pulmonary, both being the result of a common cause.

Post-mortem, the difference between the two conditions can as a rule, though not always, be determined. In the cases of pulmonary thrombosis there is found no peripheral clot, and that in the artery is firm, dense, and white in colour, with a small rounded head, pointing in the direction of the heart, resembling in every respect that which is found in a peripheral vein in which the blood is the subject of coagulation. In the cases of embolism of the pulmonary artery one finds a small clot forming a nucleus of similar texture to that found in the peripheral veins, and this embolus is surrounded by more recent fibrin, which some say can be readily distinguished from the clot which has travelled from a vessel at a distance.

Barnes has pointed out that pulmonary thrombosis is commoner among primiparæ, whereas phlegmasia alba dolens and embolism are more frequently found among multiparæ. Playfair suggests that there may be a greater tendency to deposition of fibrin in the first than in any subsequent labour, but this has not been proved.

As regards the conditions which predispose to the occurrence of puerperal pulmonary thrombosis, it is observed that during pregnancy and the puerperium there is an excess of fibrin in the blood, and that after labour there is circulating in the blood a large amount of effete matter, owing to the involution of the uterus. Further,

post-partum patients are often feeble, exhausted, and suffer from weak action of the heart; and this is especially the case after post-partum hæmorrhage,—so much so that many consider this complication the most important of all the predisposing causes. I should like here to point out that in the case I have just recorded the opposite condition prevailed, an unusually small quantity of blood being lost.

As regards exciting causes, unusual exertion is the most pronounced. The necessary blood cannot be supplied through the partially occluded vessels, syncope occurs, and this allows of further coagulation, which finally obstructs the circulation. In the same way, mental emotion causes a temporary retardation of the blood current, which favours an increase in the size of the thrombus, with obstruction of the vessel and death of the patient.

I need scarcely detail the symptoms of puerperal pulmonary thrombosis resulting in sudden death; they resemble in every respect those of pulmonary embolism so well and as a rule so easily recognised. The most striking point is the appalling suddenness with which they come on, without, in most cases, the slightest indication of impending danger. All at once, very often after some exertion, intense dyspnœa, during which the patient gasps, and struggles for breath come on, the heart fails, and speedily the sufferer dies with all the symptoms of asphyxia. The symptoms and signs of a case which is not suddenly but rapidly fatal were well illustrated and described in that reported by Dr Church.

In a very few cases recovery takes place, but these are very rare, and in such the diagnosis must always be uncertain. Still, several have been recorded in which the symptoms exhibited could be attributed to no other lesion, and in which the patients suffered from attacks, even repeated attacks, resembling, except in degree, those which in others proved fatal. Much stress has been laid on the fact that in some of those a distinct loud rasping murmur was heard in the pulmonary area, the vessel not being completely occluded, and this, as the thrombus was absorbed, gradually disappeared.

Probably many cases of supposed syncope, whether fatal or not, occurring during the puerperium are due to complete or partial obstruction of the pulmonary artery from thrombosis.

As regards the treatment of the condition, little or nothing beyond the administration of diffusible stimulants can be done; the attack generally proves fatal before a medical man reaches the patient. If, however, there is the slightest indication of partial obstruction of the pulmonary arteries during the puerperium, be it either from attacks of syncope or of dyspnœa, the recumbent position should be insisted upon for a prolonged period, and the patient in no way allowed to exert herself, while her diet should be liberal and nourishing. As suggested by Richardson, in such a

condition most authorities administer ammonia as being the agent which keeps the blood fluid in the living body; but, on the other hand, Barnes recommended the use of mineral acids to counteract the already too alkaline state of the blood which exists when thrombosis has occurred.

Dr Church advocates very strongly, and with good reason, the inhalation of oxygen. He points out that when the pulmonary artery is partly occluded less blood reaches the lungs, but then if overcharged with oxygen it would carry more oxygen into the system, and thus the patient might be kept alive until the thrombus in the vessel or vessels was absorbed.

In conclusion, and to return to my own case after this brief account of the subject of my paper, I believe it to have been one of primary pulmonary thrombosis, and this for the following reasons:—

(1.) There were no symptoms or signs, before or after death, of peripheral thrombosis—neither in the extremities nor in the broad ligaments.

(2.) The catastrophe occurred on the twelfth day, before there was time for any softening of a peripheral clot, had such existed.

(3.) It occurred at the time when puerperal thrombosis supervenes, wherever the situation may be.

(4.) The appearance and relations of the clot suggested that it had been formed *in situ*.

(5.) The patient was a primipara.

I need scarcely add that the case was certainly not one of infective phlebitis, for there was no pus in the veins, no ulceration, no metastatic abscesses, and no fever.

Dr Church thought that the Society was much indebted to Dr Lackie for this contribution on the subject of puerperal pulmonary thrombosis and embolism. The case which he had made the text of his paper was appallingly sudden in its fatal issue. It reminded the speaker of his own case, to which Dr Lackie had referred. Dr Church's patient survived longer, no doubt from the fact that the pulmonary artery or arteries were not so completely occluded by the thrombus. The accident sometimes occurs just before the birth of the child, though this is rare. In most cases of the kind the rheumatic element was generally present, and was likely, Dr Church thought, to have been the initial cause in Dr Lackie's case.

Dr Elder said that with reference to the case of which Prof. Simpson had spoken, he might say that the case was one of a primipara where labour was not specially difficult. On the third and fourth day, in the evening, there was a very slight rise of temperature to about 100°, but after this no rise of temperature at all. Patient felt well throughout the puerperium, rose for the first time about the twelfth day, and after this was still well in every respect. When

rising on the twenty-first or twenty-second day a severe attack of dyspnœa came on; patient was at the time sitting on the edge of the bed and the nurse was putting on her stockings when the attack came on with great suddenness, and patient died in less than two hours. Here there was no special exertion, and, indeed, with the exception of a slight movement of the leg, practically none, and in view of this and of the date on which the attack occurred (three weeks after labour), it was almost certain that the case was one of pulmonary embolism.

Dr Lackie replied.

VII. ON FORCEPS WITH ADJUSTABLE AXIS-TRACTION; AND ON FORCEPS FOR OCCIPITO-POSTERIOR POSITIONS OF THE VERTEX.

By R. Milne Murray, M.A., M.B., F.R.C.P., F.R.S.E., Lecturer on Midwifery and Diseases of Women, School of Medicine; Assistant-Physician, Royal Maternity Hospital.

I.

The indications for the use of the forceps may be grouped as follows—

1. Inefficiency of the powers.
2. Abnormality of the passages—*a*, Hard; *b*, soft.
3. Malpresentation or malposition of the passenger.
4. Emergencies arising in mother or child demanding speedy delivery.

Indications coming under any of these divisions, with the exceptions of the abnormalities of the hard passages, may arise with a normal condition of the bony pelvis.

From the point of view of the present paper, it will be convenient to consider the conditions of the forceps operation—

1. As occurring in a normal pelvis.
2. As occurring in an abnormal pelvis.

We may take it for granted that the great majority of forceps operations are conducted in what may reasonably be regarded as normal pelves, the commonest indications being inefficient powers, resistant soft parts, or malpositions of the head. Accordingly, assuming that there is a normal type of pelvis, we imply that there must be a normal type of forceps. By this we mean an instrument which will enable us to direct the force of traction so that no more is spent on the mother's tissues than is sufficient to overcome the friction between them and the head. In other words, such a type properly used in a normal pelvis will enable us to extract the head with a minimum of force. It is now very generally admitted that the principle on which such a type must be constructed is found in the Tarnier forceps, and five years ago

I laid before this Society a discussion of the mechanical construction of the Tarnier instrument as modified for British use by Prof. Simpson, which would best adapt it to the average pelvis. I take it that the construction then arrived at has been generally accepted; so far as I know, it has not been seriously attacked, and it is more or less closely followed by makers of these instruments.

I may briefly summarize the points of chief consequence in the construction of these instruments. The curve of the blade forms part of a circle with a 7-inch radius. This curvature was adopted as the result of experience, by which its suitability was established. The traction-rods are fixed as near the fenestrum as possible, are carried down parallel with and close to the shanks, and then curved backwards, so that the traction-handle lies in a line which forms the tangent to the curve of the blade at its middle point. By this construction the two chief advantages of Tarnier's principle are best secured. These are—1, Traction can be made in such a way as to pull the head in the axis of the pelvis for the time being; and, 2, the greatest freedom is allowed to the guiding action of the instrument, in virtue of which the application handles act as an indicator of the proper line of traction. So far, then, as the average pelvis is concerned these instruments leave little to be desired, whether we have regard to the saving of force in drawing the head through the bony canal or to the enormously increased delicacy with which we can regulate it during the process of "extension" in its passage over the perineum. So long, then, as we are dealing with approximately normal pelves, we may assume that the forceps already available are sufficient to meet all demands of axis-traction.

When, on the other hand, we consider the use of these forceps in pelves which are more or less abnormal, we readily see that an instrument which is, properly speaking, an axis-traction forceps in a normal pelvis cannot be so in an abnormal one, unless some means are provided by which the line of traction can be varied to suit the requirements of the altered canal. It is in this respect that instruments after Tarnier's principle break down and fail to justify the claim which is justly made for them in relation to the normal pelvis.

There are two variations from the normal type of pelvis which fall to be considered in relation to the forceps operation. In the first of these the sacrum is inclined less than normal, the axis of the canal at the inlet is more vertical, and the plane of the brim is more horizontal. Under this class come the justo-minor and the "masculine" pelvis.

A moment's consideration will show that traction made on a head coming through such a pelvis as this, by means of the ordinary axis-traction forceps, cannot be made in the axis proper to it. If the line of traction is right for the normal pelvis, it must obviously be too far back for this. In other words, some of the

force exerted is spent on the sacral side of the canal towards which the line of traction tends.

If there were a fixed type or pattern of such a pelvis, it would be easy to design a pair of forceps which would give us all the advantages of an ordinary instrument in a normal pelvis.

Thus it would be necessary, first, to find the proper curvature of the blades. This would obviously be less than that of the ordinary instrument, since the canal is more nearly straight. Having determined on this, it would then only be necessary to give the traction-rods a backward curve sufficient to bring the handle to lie on the tangent to the middle point of the curve. This backward curvature would be less than that of the ordinary instrument; in other words, the traction-handles would lie nearer the application-handles and the line of traction would be nearer the vertical in proportion as the justo-minor canal is less curved than the normal. But, of course, there is no fixed pattern of justo-minor pelvis; the type varies from a slight to an extreme departure from the curvature and inclination of the normal pelvis. An instrument which would act in the axis of one example would be out of truth in many others.

The second variation from the normal which we have to consider in relation to forceps operation is the flat pelvis. I do not propose, however, at this time to enter upon the question of the relative advantages of forceps and turning in flat pelvis. In the paper already referred to I have discussed this question at some length, and I intend soon to say another word upon it. I content myself meantime by saying that not only am I strongly assured on theoretical grounds of the position I then took up, but that the practical experience of the last five years has but confirmed me in my opinion.

I shall accordingly assume that there are cases of flat pelvis in which the forceps may be used; and shall proceed to consider in what way the normal instrument must be readjusted to permit of axis-traction in such types.

The features of the flat pelvis which we must keep in mind are these:—The sacrum is inclined more backwards, the plane of the brim is more vertical, and the axis of the canal at the brim is more horizontal than normal. Thus traction made by the ordinary axis-traction forceps will tend to waste force on the pubis. This is just the opposite error to that which holds in the justo-minor. It is clear that for axis-traction in a flat pelvis the line of traction must be carried further back than in a normal pelvis; that is to say, it forms a greater angle with the axis of the shank.

Here, again, a pattern of forceps could readily be constructed to meet the requirements of axis-traction in a particular example of flat pelvis. This would involve an increased curvature of the blade, and an increased curvature of the rods backward, in order to bring the handle to the proper tangential line. Such considera-

tions as these make it clear that an instrument that is truly capable of axis-traction in a normal pelvis, or in a pelvis for which it is constructed, is not so in a pelvis which diverges from the normal in one or other of the directions indicated. Nevertheless, it must never be forgotten that the ordinary axis-traction forceps is an enormous advance on the Smellie instrument in all varieties of pelves, normal and abnormal. Thus though the line of traction with these is faulty in both justo-minor and flat pelvis, it is much less vicious than with the old instrument. The "angle of error" —*i.e.*, the angle formed by the intersection of the actual and the true line of traction—is greatly reduced by the properly constructed Tarnier instrument, and hence the facility with which delivery can be effected by them in many cases of abnormal pelvis where the other had failed. But while the angle of error vanishes in the action of the Tarnier forceps in the normal pelvis, it reappears to a greater or less degree when they come to be used in a pelvis of the flat or justo-minor type.

It is with the view of meeting this difficulty of providing an instrument whose line of traction can be varied within considerable limits at will that I have devised the forceps I now desire to describe and show to the Society to-night.

The forceps itself is identical in all respects with the instrument which has been in use here for some years. It is built entirely of steel, and I have kept to the same curvature of blades, viz., one of 7-inch radius. So far as the pelvic curve is concerned, the curvature is of little consequence in relation to the variation in pelvic type. The advantage of the pelvic curve does not lie in its special adaptability to any particular type of pelvis, but mainly in its relation to the power of grasping and holding the fœtal head to the best advantage. No doubt certain minor advantages might be gained by being able to vary the amount of curvature, but these are small, and bear no relation to the question of axis-traction. The main object is that the line of traction shall pass through the middle point of the sub-occipito-bregmatic plane in vertex cases, where flexion is part of the mechanism at the brim, and through the middle point of the occipito-frontal plane, where extension occurs at the brim. If the curvature of the blade is such that the head is properly caught and held in such a way that it has no tendency to rotate in the forceps, the exact amount of curvature is of comparatively slight importance.

The traction-rods are jointed to the blades in the usual way, as near the fenestrum as possible. They then run down close to the shanks and along the back of the handles, and at a point half-way down they then turn back at a right angle for a distance of nearly 4½ inches. The horizontal part of these rods is oval in section, and the upper one is divided into distances half an inch apart, which are numbered 0 to 7.

The handle is applied to these horizontal rods by a block pierced

Explanation of Plates.

Plate I.

Diagram to illustrate the principle of Adjustable Axis-traction.

The lines M^1 N^1 F^1 represent the inclination of the plane of the brim in *Justo-minor*, *Normal*, and *Flat* pelves respectively.

The lines M^2 N^2 F^2 represent the direction of the axis of the brim in these pelves.

A B, axis of blade of forceps.

C D, horizontal limb of traction rod.

The points M^2 N^2 F^2 on C D indicate the position of the traction handle when adjusted for traction through the planes M^1 N^1 F^1 in the axes M^2 N^2 F^2 respectively.

It is obvious that if the pelvic canal were straight, and the plane of the brim horizontal, the proper line of traction would be along the axis A B, and accordingly the greater or less the inclination of the pelvis and the plane of the brim, the greater or less must be the angle formed by the proper line of traction and the axis of the forceps A B.

Plate II.

Diagram to illustrate construction of Adjustable Axis-traction Forceps.

The outline represents inner aspect of left blade of forceps.

A B, pelvic plane through which forceps is supposed to be acting for the time being.

D, middle point of blade.

C D E, part of circle of which an arc passes through the middle of blade.

G H K, traction rod hinged to blade at K, and of which K H is the vertical and G H the horizontal limb.

N N^1, tangent to the arc of the blade at the point D. The point at which this tangent cuts the limb G H, is the point at which the traction handle must be fixed for traction in a *normally* shaped pelvis.

For traction in *Flat pelves*—that is to say, those in which the plane of the brim is more vertical than normal—the handle must be shifted on the limb G H, more or less in the direction F; and for traction in pelves in which the plane of the brim is more horizontal than normal, as in most *Justo-minor* and some others, the handle must be shifted more or less in the direction M.

Plate III.

Adjustable Axis-traction Forceps.

Plate IV.

Forceps for delivery in *Occipito-posterior cases.*

The blades are bent so that the pelvic curve has a radius of 14 inches as against 7 inches in the ordinary forceps.

They may be fitted with ordinary traction rods, or, as in this case, with adjustable traction rods.

Plate I

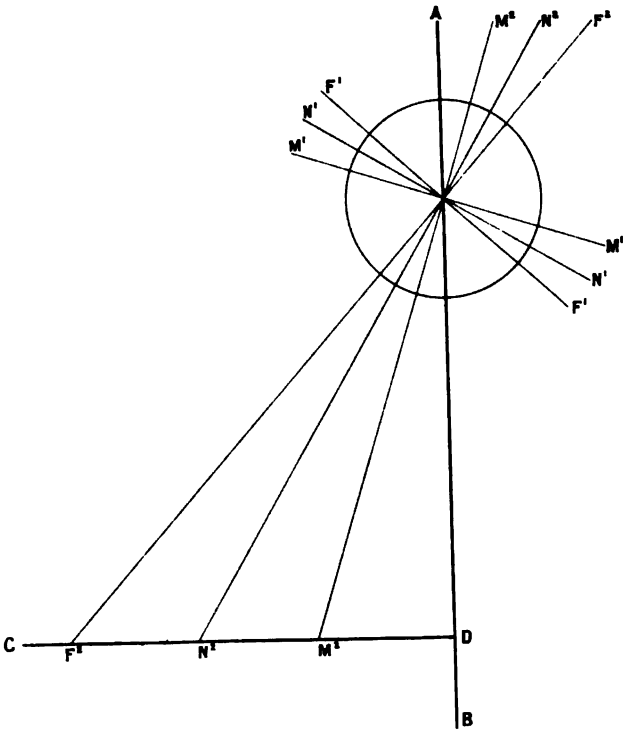


Plate II

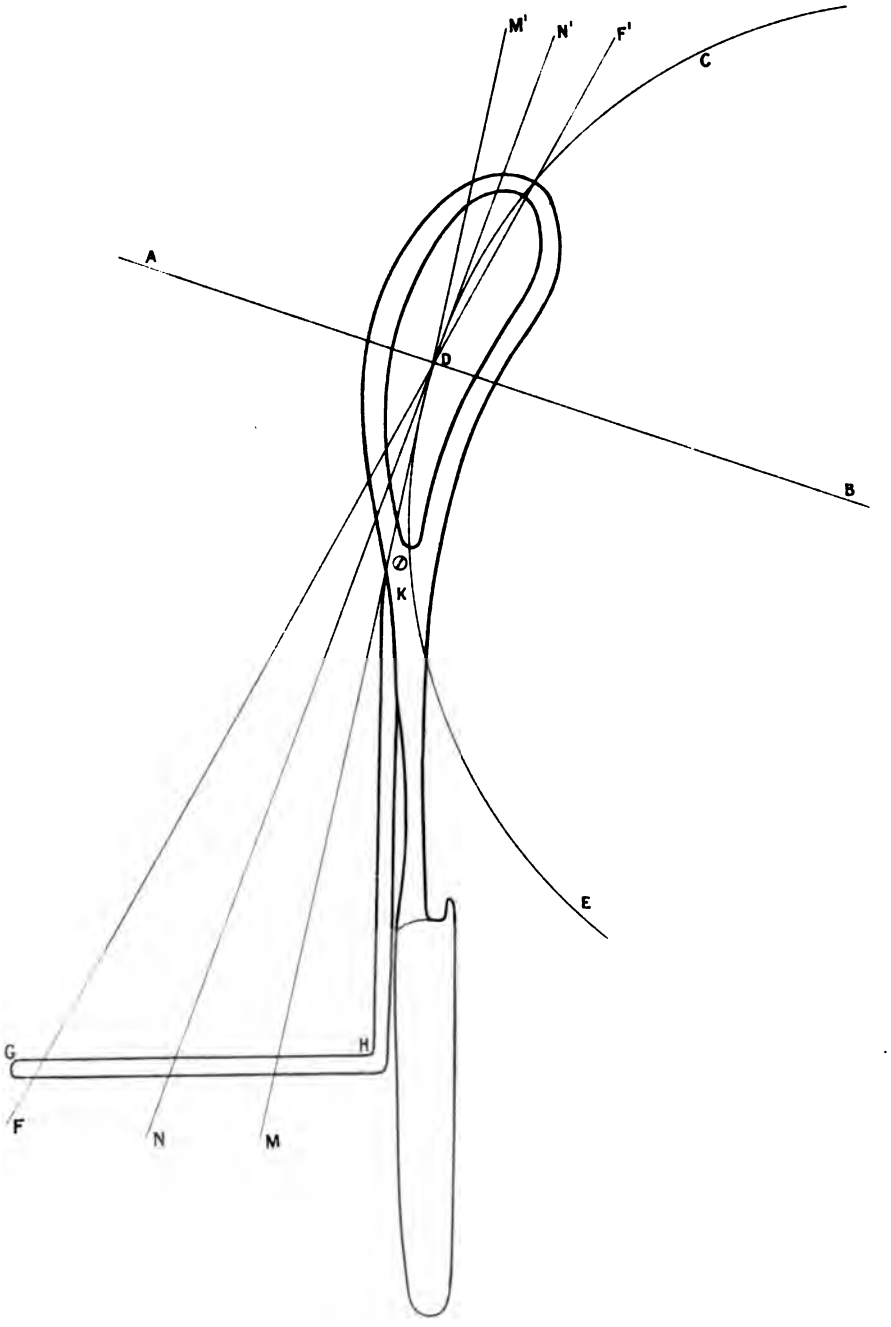


Plate III

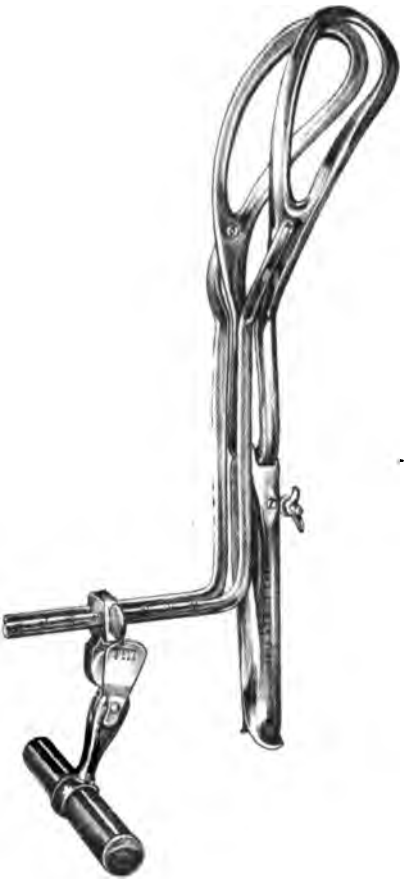


Plate IV

to allow them to pass through. This block can be fixed in any position by a pinching screw, which is secured in such a way that it cannot slip out. To this block is fixed the handle by a joint which permits motion in a plane parallel to the rods. This motion is necessary to allow the handle to fall into the proper line of traction for each position on the rods. To the pin of the hinge-joint is fixed a sector, which moves with the handle. The periphery of the sector has marked on it the position proper to it for each position of the block on the rods. Against one of these marks is placed the word "normal." When the handle is adjusted to this mark the instrument is, as regards construction and efficiency, an ordinary pair of axis-traction forceps.

To adapt them to a pelvis whose inclination is less than normal, it is only necessary to shift the block one or more divisions nearer the handle; while to adapt them to one whose inclination is greater than normal, the block must be moved one or two divisions further from the handle. If the index is kept at the figure on the section corresponding to the figure at which the block is set on the handle, the line of traction will always pass through the centre of the fenestrum; but, of course, its inclination to the vertical will vary with the position on the rods at which the handle is fixed.

Mode of Use.

The question now arises, How is the instrument to be employed so as to obtain the advantages of adjustable axis-traction?

As to Normal Pelves.—When the operation is being conducted in a pelvis of normal type and dimensions, it is only necessary, after applying the instrument in the ordinary way, to set the handle at the figure marked "normal," and to use the instrument exactly as we use the ordinary forceps. We have the same guide in the application-handles as to direction of pull, and the same rules will regulate its use.

In Justo-minor Pelves.—It is, of course, impossible by any means at our disposal to determine the precise inclination of the brim of a justo-minor pelvis. If it were so it would be possible to set the handle at the exact position proper to any given pelvis. It is, however, a comparatively simple matter to determine whether or not a pelvis is of the justo-minor type. If this character is marked, we may assume that the inclination of the brim is more horizontal than normal and its axis more vertical. This being so, it will be proper to fix the block at a mark nearer the application-handles than the "normal" one. The degree of contraction, the amount of flexion present if the head is engaged, the difficulty of engagement, may all help us to decide as to how much further in than the normal mark we may reasonably set the handle. *Thus in a difficult case, instead of making a series of pulls with the line of traction in one position, as is necessary with the ordinary instrument,*

we may make a succession of pulls, changing the position of the handle and the direction of traction until we find the adjustment which seems to have most effect in advancing the head.

In Flat Pelves.—On the other hand, suppose we are dealing with a flat pelvis. The head in this case always lies in the transverse at the brim, and the anterior fontanelle is as low or lower than the posterior. Extension characterizes the attitude of the head. Here the line of traction is behind the "normal." The handle must accordingly be shifted backwards along the traction-rods to an extent which will correspond to the degree of flattening, so as to bring the line of traction into line with the axis of the pelvic outlet. The true position will be obtained by trial, though a little experience will give a fair guide to the correct adjustment in most cases.

The following advantages may be claimed for these instruments:—

1*st.* Simplicity of construction and manufacture.

2*nd.* Simplicity of parts and ease with which they can be cleaned.

3*rd.* Ease of application.

4*th.* Wide range of action.

II.

One of the commonest indications for the use of forceps, both at the brim and in the cavity, is the occipito-posterior position of the head. In a certain number of these cases the forceps are applied with the occiput in the posterior half of the pelvis, in others with the long diameter of the head almost in the transverse, and in others when rotation is partially or wholly accomplished, and the occiput has arrived in the anterior half of the pelvis. Three terminations of an occipito-posterior case may occur—1. The occiput may remain posterior, descent occurring with the head in a state of flexion. 2. Anterior rotation may begin, but owing to certain circumstances may be checked at such a stage as to leave the head impacted in the transverse diameter of the cavity. 3. The most common termination is complete rotation of the occiput forward, so that delivery takes place as in an anterior case. In the first two conditions the forceps is almost invariably indicated; in the last they are frequently required on account of the delay and exhaustion consequent on the tedious process of anterior rotation. The application of the forceps in the last group of cases does not differ materially from that required in anterior cases, but in those cases where the occiput remains posterior it has long been recognised that the use of the forceps is associated with difficulty and danger of a marked character. So pronounced are these complications of the forceps operation that it is almost universally admitted that in all cases where anterior rotation is

likely to occur it is better to wait until the occiput has come forward before attempting the application of the blades.

Before proceeding to consider the special difficulties associated with the forceps in persistent occipito-posterior cases, I should like to say a word or two on the conditions which seem to prevent or to favour anterior rotation. For if we can recognise at an early stage of labour that anterior rotation is unlikely to occur, it seems to me useless to defer the application of the forceps after the os is fully dilated and the passages in a fit state. I think the three terminations of posterior cases previously referred to depend severally on the following conditions associated with the early progress of the labour.

1. If flexion is found well-marked,—that is, if the posterior fontanelle is well down and the anterior almost or entirely out of reach, and the pains at first not too frequent nor too vigorous, anterior rotation may be expected to occur.

2. If flexion is imperfect,—that is, if the anterior fontanelle can be easily felt, and the pains are moderate as to strength and frequency,—anterior rotation will begin, but there is a risk of the head failing to turn beyond the transverse, and consequently becoming impacted.

3. If flexion is imperfect, as in the last case, but the pains vigorous and rapid, the head will almost certainly slip back into the hollow of the sacrum, and the condition become persistent.

Any one who has had to deliver one of those cases in which the head becomes impacted in the transverse will have recognised the very great difficulty associated with its delivery, and also the risks connected with sloughing of the vagina, which are apt to arise at a subsequent period. The utmost care should always be exercised to prevent such a complication occurring. That anterior rotation is the most desirable mechanism is generally recognised, and various methods are commended by authorities to assist this process. For example, a favourite procedure was the employment of a twisting or rotatory motion applied to the handles of the forceps. The risks of such a proceeding are, however, so obvious, that a word of warning against the practice is found in most text-books. Manual rotation is another method which retains a certain degree of favour at the present time. Herman, for example, in his *Difficult Labour* speaks in high terms of the efficiency of the method specially described by him. I have given this method a careful trial in many cases of occipito-posterior, and have come to the conclusion that the cases in which it seems to be effective are just those cases that would have come forward had they been left alone. For in cases where the pains were not too active, and where flexion is well developed, it is the easiest thing in the world to turn the head inside the vagina, so as to bring the occiput round towards the pubis. On the other hand, in those cases which are marked by imperfect flexion it is with the greatest difficulty,

either during a pain or in an interval, that the occiput can be turned from its posterior attitude. Probably the chief explanation of the difference between these two cases depends upon the difference in the length of the cephalic diameters engaged. Probably if flexion could be developed in the latter case, rotation would be rendered proportionately easy. It should further be borne in mind that the chief factor in the development of rotation is the general converging slope of the pelvic floor to the middle line and to the front. It is quite obvious that the mere twisting of the head by the hand inside the pelvis is a very partial imitation of, or substitute for, the natural mechanism, and unless the head is at the same time brought down and so kept in contact with the sloping floor, it seems inevitable that its immediate tendency will be to return to its former position.

The almost unfailing certainty with which a well-flexed occipito-posterior head will turn forward under the influence of normal uterine pains leads one to conclude that the natural mechanism will be most nearly reproduced, both as regards mode and result, if in those cases where flexion is imperfect and contractions are inefficient we adopt a procedure which will increase flexion and at the same time bring the head to bear on the sloping floor of the pelvis.

The axis-traction forceps, as has long ago been pointed out, possesses one outstanding advantage over the older instrument, in so far that the swivel joint by which the traction handle is connected with the rods in no way interferes with any natural tendency which the head may have to rotate in its passage through the canal. Provided, then, flexion is secured, these forceps should in no way interfere with the desired rotation of an occipito-posterior head. Accordingly the question arises, how far the ordinary axis-traction forceps tend to promote flexion in an occipito-posterior head where that happens to be defective. In my former paper I discussed at length the essential advantage associated with the pelvic curve of the ordinary forceps, and I pointed out that the particular gain obtained by its use was that it grasped the head in such a way that in an occipito-anterior case it tended to favour or to increase flexion. It is impossible to apply a pair of straight forceps to an occipito-anterior case without seizing the head so near the sinciput that flexion is markedly impaired, provided regard is had to the integrity of the perineum. A moment's consideration will show that this very virtue of the pelvic curve in relation to occipito-anterior cases becomes a more or less manifest vice in relation to occipito-posteriors, for the grasp of the head in the latter case will be as effective in undoing flexion as it was effective in the former case in increasing it.

It seems essential, then, that some modification of the pelvic curve must be made if forceps are to be employed for the purpose of developing or increasing flexion in occipito-posterior cases. One

of the arguments advanced by Leishman, Lazarewitch, and other advocates of the straight forceps was their usefulness under certain conditions in posterior cases. But one of the difficulties which must be obvious to any one who has attempted to apply the straight forceps to an occipito-posterior case is the amount of trouble involved in grasping the head in such a way that the forceps will not slip off. Further, it must be borne in mind that the ordinary straight forceps in no way favours the rotation which is so essential a part of the mechanism.

The ideal instrument for such cases will be one which, acting in the axis of the pelvis, seizes the head in such a way as—1st, to secure a firm hold; 2nd, to increase flexion; 3rd, to favour, or at least not to interfere with, normal rotation.

I venture to think that the instrument which I show you meets these requirements. If so, you will see that the end has been attained by very simple means. The only modification on the ordinary forceps consists of a flattening of the curve to a radius of 14 instead of 7 inches. By this means the head is caught sufficiently near the parietal bosses to secure a perfectly firm grip, which increases in certainty the more the occiput descends. Further, the flattening of the curve brings the blades to bear on the head in such a way as to depress the occiput, while, of course, the swivel action of the handle favours the forward rotation as descent occurs. I have used these forceps in five cases. In two of these cases flexion was well marked, but the labour was slow; rotation occurred in a perfectly satisfactory way, and in one of them I delivered over the perineum without altering the grip of the instrument. For though the concave side of the blade was lying backwards as the head passed over the perineum, the slight curvature did not interfere with that structure. In two of the cases flexion was imperfectly developed, the anterior fontanelle being within easy reach; in one of these prolonged attempts had been made to deliver with ordinary axis-traction forceps. In both the application of these forceps was followed by the immediate development of flexion, and subsequently by anterior rotation. In the last, rotation did not occur, but delivery, as a persistent occipito-posterior without damage to the soft parts, was accomplished with remarkable ease.

In conclusion, I should like to point out that much of the success in the use of these and other forceps depends upon the manner in which the tractive force is applied. A uterine pain begins in an almost imperceptible fashion, its invasion is prolonged, and its climax reached with the finest progressive graduation of intensity. In this way the reaction of the resilient soft parts on the movement of the head is given full play, and their guiding effect on the advancing head-globe fully taken advantage of. It follows, then, that every tractive effort made by means of the forceps should follow the same rule. It is obviously of the utmost importance

that the force should be applied as carefully and as gradually as is the case with the uterine pain. Any departure from this method, and the application of a sudden effort or "jerk," must so displace the more or less resilient soft parts, and almost entirely abolish any guiding influence which they naturally possess.

Dr Haultain congratulated Dr Milne Murray on his interesting and instructive paper, which was fraught with so many points of practical value, and which were considered with such characteristic ingenuity that it was quite impossible to thoroughly appreciate or criticise on such short acquaintance. There could be little doubt that the forceps described were a distinct advance in the perfection of the instrument, both in the ease in which traction in the varied axes of the brim could be performed, and also in the delivery of occipito-posteriors, where from the occipital grip the normal mechanism of flexion was assisted. It certainly appeared to one at first that, perhaps, they were too scientific, and entailed for their practical working a perhaps more than ordinary appreciation of the angles of the plane of the brim and their corresponding axes. But when it was considered that it was unnecessary to vary the line of traction unless one felt inclined, and by fixing the handles at normal one had an ordinary pair of forceps, it certainly was no argument against, but strongly for, the instrument. He had always in the delivery of occipito-posterior positions by forceps tried to grip the head as far back as possible, but with ordinary forceps the pelvic curve was too great, and the liability to slipping of the blades in the posterior position was increased. The straight forceps Dr Murray had devised were unquestionably a distinct improvement, in that they made a posterior grip a necessity, and, as had been shown, did not require to be reapplied if anterior rotation occurred. While on the question of axis-traction forceps, however, he would like to say that he did not entirely agree with Dr Murray that in traction one should always pull with the traction rods parallel with the application shanks, as not only theoretically but practically he had frequently found the adoption of this rule wrong. It was specially apparent in occipito-posterior positions which were extended high in the pelvis, and in this attitude gripped by the forceps. As was theoretically evident, whenever traction was now performed and descent of the occiput or flexion commenced, the application handles which were fixed to the head by the blades were naturally thrown forward in such a manner that the curved line of traction certainly could not be with the traction rods parallel with the application shanks. Thus, when we came to the outlet where, in these persistent "face to pubis" cases, the movement of flexion was extreme, the application handles frequently pointed straight up the abdomen, altogether too far forward as a guide for the line of traction. In these cases, it seemed to him either of two courses was open,—

to remove the blades and re-apply, or to judge of the axis of the outlet for one's self, and pull in that direction. Times and again had he met with such cases where, pulling with the traction rods parallel to the application shanks, the head was simply pulled against the pubis and delivery impossible, while by re-applying or pulling in the axis of the outlet delivery was easy.

Dr J. C. Webster said that he had listened to Dr Murray's paper with great pleasure. The Society had been indebted to Dr Murray in former years for an elaborate account of the evolution of the forceps as well as of the modes of action of the different varieties. This work had been studied by Dr Webster to great profit. The present paper seemed to be a fitting and necessary supplement to his former communication. It described what must be considered as the last stage in the evolution of the forceps. The elaborated instrument devised by Dr Murray promised to be of service to specialists who are well acquainted with the different forms of deformed pelvis. He doubted if the general practitioner would gain by adopting the instrument, because he is not apt to distinguish the nature of the pelvic contraction sufficiently easily to enable him to alter the position of the traction-handle so as to pull to best advantage. Even with the most skilled expert the arrangement can only be made approximately correct. Perhaps the practitioner is safer with the ordinary axis-traction forceps, which are made with reference to a pelvis with the most frequent pelvic axis. In reference to the forceps devised for occipito-posterior cases, while agreeing with Dr Murray as regards the correctness of the principle on which their construction was based, he did not consider them to be a practical necessity. The ordinary axis-traction forceps sufficed for the extraction of a head in such cases, though it was necessary when the head rotated to cease pulling, to remove the blades, and to re-apply them.

VIII. CONGENITAL TEETH, WITH THREE ILLUSTRATIVE CASES.

By J. W. Ballantyne, M.D., F.R.C.P.E., F.R.S.E.

In the month of January 1894 I met with a case of congenital teeth in my practice; during the latter half of 1895 Dr Vargas of Barcelona was good enough to place at my disposal his notes upon a very instructive case of extra-alveolar dental sac in a new-born infant; and quite recently my friend Dr R. C. Buist of Dundee has been so kind as to furnish me with the details of a child born at the full time with two incisor teeth already "cut." From the consideration of these three instances of precocious dentition, and from a survey of similar cases which have been reported by various observers, it will be possible to draw some conclusions regarding the nature and mode of origin of the anomaly. Since the ob-

servation recorded by Dr Vargas had several peculiarities which were of quite unusual interest, it may be presented first; I give the report almost in the very form in which it reached me.

1. A Case of an Extra-alveolar Dental Sac in a New-born Child.

The case which is described by Dr Andres Martinez Vargas, Professor of Diseases of Children in the University of Barcelona, was met with by him in his Pediatric Clinic, to which it had been sent by Dr Bonet Amigo, Professor of Diseases of Women and Practical Obstetrics in the same University. It was of special interest, because at first sight it was thought to be a congenital neoplasm of the gums, but during its removal by operation it was discovered to be a premature tooth enclosed in an extra-alveolar sac.

The child, a boy, was born on the 13th of October 1895, under very good conditions. The mother noticed at once that the infant could not take the breast, partly because he was unable to close his mouth, and partly on account of marked tongue-tie. Dr Vargas examined the boy when two days old, and found in the lower jaw and a little to the right of the middle line a marked projection covered with the buccal mucous membrane (*vide* Plate). It had a cylindrical form, rather flattened from before backwards, and was of uniform consistence. It measured 4 mms. in length, 2 mms. in width, and had an antero-posterior diameter of 1·5 mm. It had its origin in the upper border and posterior surface of the lower jaw, in the position corresponding to the central incisor of the right side. In appearance and colour it exactly resembled the rest of the mucous membrane. It was of hard consistence, resembling cartilaginous or fibrous tissue. Its direction was upwards and rather forwards; but on attempting to close the mouth the projection came against the upper jaw and thus interfered with the coming together of the lips; the child was, therefore, unable to grasp the nipple. It had a broad base and was movable. The frænum linguæ was abnormally large and strong.

Seeing that it was necessary to enable the child to perform the act of sucking, Dr Vargas at once cut away the frænum. On the following day he operated for the removal of the projection from the lower jaw. It was found to be more movable than when first examined, and its upper border showed an erosion due to its rubbing against the upper jaw. Since it was regarded as a neoplasm, Dr Vargas, after anæsthetising the gum with a solution of cocaine, proceeded to remove the projection with a probe-pointed knife. While cutting through the base he noticed that something white and hard like bone could be seen on the top of the projection. He then found on close inspection that it was a tooth. The operation was completed by means of curved scissors, and the wound was afterwards touched with an astringent solution. The

Dr Vargas' case of Extra-alveolar Dental Sac.

hæmorrhage was very slight. The child was then able to suck quite easily, and the result of the operation was therefore quite satisfactory.

The peculiar interest of the case consisted in the fact that the tooth was quite covered by the mucous membrane. It was also movable at its base, and was not, therefore, a premature tooth firmly fixed in its alveolar cavity, but one without a fang enclosed in its dental sac, which in this instance was extra-alveolar. Close examination showed that its covering was composed of two principal layers,—an outer one, consisting of the buccal mucous membrane, and an inner layer of very vascular connective tissue, which formed the external layer of the dental sac. The tooth, when extracted, appeared to be composed of the enamel and of the dentine which constitute the cavity of the pulp. There was no root or anything like one. Dr Vargas, therefore, suspected that the calcification of the tooth had been interrupted, and that this accounted for its mobility from the very first. He would place it in that group of premature teeth in which a lesion of the embryonic tissue interferes with the formation of the fang. It is right to remove such teeth in order to facilitate the act of suction; the operation is easy and free from danger.

2. Case of Two Incisor Teeth in a New-born Infant.

In January 1894 I attended Mrs A., 40 years of age, in her second confinement. During the weeks immediately preceding the full time she suffered from influenza. Forceps were needed on account of uterine inertia, due to the presence of a subperitoneal fibroid situated near the fundus uteri. The infant, a male, was small and feeble at the time of birth. He was brought up on the bottle, as the mother was unable to nurse. A few days after his birth my attention was drawn to his mouth, and there in the lower jaw were the two central incisors. They could be easily seen and felt, although they were thin scales and only projected about ⅛ inch above the gums, which, it may be mentioned, seemed somewhat atrophic. The teeth had not the normal bright white appearance, but resembled in their characters teeth discoloured by the use of iron tonics. They were slightly movable, but as they did not cause the infant any annoyance they were not extracted. According to the mother's statement they were absorbed, and two new central incisors appeared in their place about the seventh month; but it is more probable that they dropped out as the new teeth forced their way to the surface. The child was and is quite healthy; but his elder brother died of tubercular meningitis at the age of 3 years, and there are signs of phthisis in another member of the family.

3. Case of Congenital Teeth.

For the notes of this case I am indebted to Dr R. C. Buist. They are as follow:—The child, a male, was born at the full term on December 18, 1893. It was at once noticed that the two lower central incisors were already "cut." Both projected distinctly above the gum, the right one about 2 mms., the left rather less. They could be rocked backwards and forwards. The gum at the roots was swollen, and its edges, both before and behind, were slightly everted. The eversion became distinctly less in the course of a few days, and the teeth were rather more firmly held. Both teeth came out during the first month of life, and have not been replaced, although the dentition is otherwise normal. It was stated that the teeth felt soft in the hand, "like gristle." The child is healthy, and has been bottle-fed. He was illegitimate.

Congenital Teeth.

Historical Notes.—That infants are occasionally born with one or more teeth already cut is a fact which was well known to the ancients; indeed, such are mentioned in the very ancient cuneiform inscriptions found at Nineveh (*vide* my paper on the "Teratological Records of Chaldea," *Teratologia*, i. p. 134, 1894). The meaning which was ascribed to such occurrences may be learned from the following passage in Pliny's *Natural History*, which I give in the words of Holland's *Translation* (2)[1]:—"Certaine it is also, that some children are borne into the world with teeth, as *M. Curius*, who thereupon was surnamed *Dentatus*, and *Cn. Papyrius Carbo*, both of them very great men and right honourable personages. In women the same was counted but an unluckie thing, and presaged some misfortune, especially in the daies of the KK. regiment in Rome: for when *Valeria* was borne toothed, the wizards and soothsayers being consulted thereabout, answered out of their learning by way of prophesie, That looke into what citie she was carried to nource, she should be the cause of the ruine and subversion thereof: whereupon had away shee was and conveyed to Suessa Pometia, a citie of that time most flourishing in wealth and riches: and it prooved most true in the end, for that cittie was utterly destroyed."

From this extract it may be gathered that congenital teeth in a male child were regarded as a good omen, but as a bad one if the infant was a girl. Instances illustrating this belief may be cited from various medical writers; thus Polidore Virgil (3), in his work *De Prodigiis*, reported that in the year 1456 an infant with six teeth was born; the sex of the child was not stated, but surely it must have been a girl, for Virgil went on to say that at that time the Turks began to invade our lands. The same case was referred to by

[1] The figures within parentheses refer to Literature at end of paper.

Lycosthenes (4) in the following words:—"In agro Piceno eodem tempore ortus infans dentibus sex, facie insolitae magnitudinis, futurae calamitatis, quae postea secuta est magna profecto indicia."

Weinrichius (6) in his quaint old book, published in 1595, devoted part of a chapter to toothed and bearded infants ("infantes barbati et dentati"), and placed Zoroaster with Marcus Curius as historical instances of premature dentition; he ventured also to find a cause for the anomaly in the determination of a large quantity of semen of great vital activity to the spot where the teeth are formed. J. Schenkius (8) referred to the cases already mentioned, and added three others from the works of Livy (1), M. Donatus (5), and Benedictus (7). Marcellinus Ammianus, the historian, spoke of an infant born near Antioch in 359 A.D. which had two mouths, two teeth, a beard, and four eyes. The occurrence was believed to presage evil to the Republic.

During the seventeenth century some further instances of congenital teeth were recorded; and M. Schurig (15) in his *Embryologia historico-medica*, published in 1732, was able to present to his readers a group of observations which included those of Crausius (14), Hellwig (10), Ludovicus (12), Rhodion (9), Göckel (13), and the others which have been named already. Thomas Bartholin (11), writing in 1654, thought that in the presence of such dental anomalies was to be found the cause of the *vagitus uterinus*. J. Graetzer (18), writing about a century later than Schurig, added nothing further to our knowledge of congenital teeth beyond the remark that Carus had collected some additional cases.

During the last fifty or sixty years numerous observations have been made upon instances of congenital teeth, many of which have escaped indexing from the obscure and brief manner in which they have been recorded. Some references were collected by Dr Vargas in connexion with his case above recorded, and I have added considerably to the list; but doubtless many instances still lie hidden away in text-books and medical and dental journals. From the references which have been gathered together it will be seen that the presence of teeth, especially of lower incisors, at birth is not an unknown occurrence, as Blot had thought (*Bull. Soc. de Chir. de Paris*, p. 185, 1868); at the same time the phenomenon is far from common, for many obstetricians have never met with a single instance of it.

It would not be right to close this historical sketch without a reference to the famous personages in English and French history who are popularly believed to have been born with teeth. These were Richard III., Louis XIV., Richelieu, Mirabeau, and Mazarin. That Shakespeare was acquainted with the belief that Richard III. was a dentate infant is borne out by several passages in his works. Thus, in *King Richard the Third*, Act ii., sc. 4, the Duchess of York says,—

> "Marry, they say my uncle grew so fast
> That he could gnaw a crust at two hours old;
> 'Twas full two years ere I could get a tooth."

Also in Act iv., sc. 4 of the same play, Queen Margaret says,—

> "That dog that had his teeth before his eyes."

And in *King Henry the Sixth*, Part III., Act v., sc. 6, the following words occur,—

> "Teeth hadst thou in thy head, when thou wast born,
> To signify, thou cam'st to bite the world."

And Richard himself says,—

> "For I have often heard my mother say
> I came into the world with my legs forward:
> . . . . . .
> The midwife wonder'd and the women cried,
> *O Jesus bless us, he is born with teeth!*
> And so I was; which plainly signified,
> That I should snarl, and bite, and play the dog."

With the story of the birth in Germany of an infant with a golden tooth we need not here concern ourselves; it was supposed to indicate the near approach of the Golden Age, and doubtless the story had as much truth in it as there has been fulfilment of the prediction based upon it.

Frequency.—There can be no doubt that congenital teeth are rarely met with. Out of 17,578 new-born infants at the Paris Maternity between 1858 and 1868 only three had teeth, or not much more than one in six thousand. Out of 500 cases, collected by Magitot (35), in which the time of eruption of the first tooth was noted, in only one were there teeth at birth. In 20,000 births Blot said he had never seen an instance; whilst, on the other hand, Besnier and Gueniot regarded them as very common. Neither experience can be regarded as usual, and the truth lies doubtless between the two extremes. In the present paper some seventy observations have been gathered together from literature, and doubtless not a few have escaped notice.

Clinical History.—The history which is usually given in cases of congenital teeth is that at the time of birth the doctor or nurse, having occasion to put a finger in the infant's mouth, discovered the anomaly, or that some hours or days later the mother became aware of the unusual state of matters through the wounding of her nipples by the teeth of the child during nursing.

The pregnancy of which the dentate infant was the result seems generally to have been uneventful. Occasionally, however, it terminated prematurely: at the sixth month in the observation of Crausius (14), at the seventh in Hellwig's case (10), and "prematurely" in that of Lamm (25). In the case seen by me (65) the

mother had influenza during the last weeks of gestation, and in a few other instances the maternal health was not good. The fact that the mother of the dentate infant seen by Flesch (58) had had ten teeth and roots extracted in the third month of her pregnancy must be regarded solely as a curious coincidence, as must also the statement that the mother in No. 59 dreamed of the birth of a toothed infant the night before labour began.

In most of the recorded cases there was no history of malformations or of congenital teeth in the parents; but Nos. 31 and 60 were striking exceptions. In the remarkable instance cited by Mattei (31) the infant's mother had also been born with a tooth; and in Limrick's recently reported case (60) the woman had two teeth at birth, her second child, a boy, showed the same anomaly, and her sister's first child, a girl, also came into the world with two lower incisor teeth.

The parents seem generally to have been healthy, but in No. 33 the mother was slightly strumous, in No. 32 there was a family history of tubercle on the father's side, and in No. 65 an elder brother of the infant died of tubercular meningitis. These three cases, however, form the only evidence in favour of the association of premature development of the teeth with a tubercular family history.

Symptomatology.—So far as sex is concerned the tooth-bearing new-born infant has been male nearly as often as female: in fifteen cases (Nos. 9, 10, 24*b*, 29, 35*a* and *b*, 36, 37, 53, 57, 59, 60*b*, 64, 65, and 66) the infant was a boy; in seventeen cases (Nos. 5, 11, 12, 14, 21, 23, 24*a*, 31, 32, 33, 34, 40, 48, 56, 60*a* and *c*, and 63) a girl.

In the vast majority of cases the premature teeth were incisors, usually central, of the lower jaw (*e.g.*, in Nos. 10, 14, 21, 22, 23, 25, 26, 31, 33, 35, 36, 40, 41, 43, 47, 48, 50, 54, 57, 58, 60, 64, 65, and 66). Where one of the lower central incisors was present at birth the other sometimes made its appearance two or three weeks later (*e.g.*, No. 57). In a few cases the congenital tooth was an upper incisor (Nos. 27, 30*b*, 34, 52, and 62), and in two of these instances the occurrence was associated with a cleft palate and inter-maxillary bone (Nos. 27 and 62). In one or two observations there were incisors in both jaws: thus in No. 12 it was so, and curiously enough the result was the transfixion of the tongue thereby, here also there was harelip; and in No. 30*a* there were upper and lower central incisors. More rarely were molar teeth present at the time of birth: this was the case, however, in Bartholin's observation (No. 11) in which there were two molars, and in Jacobi's (No. 42). In the infant seen by Thomas (29) there were nine teeth (incisors and molars) seen at birth, in Bouchut's case (37) there were two lower incisors and one molar, and in Kaufman's (59) it was said that there was a "full set of teeth in the upper and lower maxillæ." In a cyclopian fœtus described by M'Lin (61) it is stated that "the mouth contained an ivory tusk-like tooth

in each corner," and in one or two instances (*e.g.*, Nos. 3, 5, 9, etc.) the nature of the teeth is not recorded.

A reference may be made in passing to the curious belief that the *vagitus uterinus* occurred in infants born with teeth: the notion is thus expressed by T. Bartholin (11), "incitantur ad vagitum ob doloris quemcunque sensum, sive uteri angusti, sive dentium prurientium, sive extinctae matris."

In some cases the teeth seem to have given rise to no trouble even when the mother herself nursed the infant; but in the majority of at any rate the recorded instances they apparently acted like foreign bodies in the child's mouth, besides causing injury to the maternal nipples. In several observations the statement is found that the little patient was unable to draw the breast properly, and so, getting little milk, began to waste away and was in danger of death. In such cases the removal of the offending teeth usually led to complete recovery, and in Levison's report (21) the improvement following their extraction was described as "marvellous." The teeth interfere with nursing both by causing the mother pain and by preventing the perfect suction due to complete closure of the mouth of the infant.

In a few instances the teeth gave rise to ulcerations on the lower surface of the tongue. This was specially well-marked in Besnier's case (40), in which, at the age of three weeks, coryza came on, accompanied by frequent sneezing, with the result that the sharp dental borders caused a sub-lingual ulcer very closely resembling that so often seen in whooping-cough. Similar ulcers were produced in Nos. 33, 41, and 48; and the mucous membrane of the lip or gum was sometimes affected in like manner (*e.g.*, No. 52).

It is seldom that the later history of infants born with teeth is forthcoming, so that the general symptomatology is little known. It would seem that the premature teeth, often loosely implanted to begin with, usually fall out or are pulled out in a short time after birth: at fifteen days in No. 32, in six weeks in one of Billard's cases (17), and in two months in No. 30. In such instances their places remain unfilled until the commencement of the second dentition; thus in one of Hutchinson's cases (23) two lower incisors removed soon after birth had not been replaced at the third year; but occasionally the teeth seem to have been supernumerary as well as premature, and are replaced by the regular milk teeth (30*b* and 65). In other instances they do not fall out but remain *in situ*, the others of the first dentition growing in around them: the father of Tissier's patient (34) said that at the age of *six* months the girl had all her temporary teeth, which were still to be seen at seven years; in Besnier's case (40), on the other hand, the rest of the eruption was slow and also irregular, the first molars appearing before the lower lateral incisors; and in one of Mattei's observations (31*b*), a girl 5 years of age, two lower incisors cut at birth were still present, and all the first set had been visible at sixteen months. In such

cases the congenital teeth may be recognised by their small size. A very curious after-history was that reported by Stocker (56); he noted the case of an old lady who had been born with three or four teeth, and who, at the age of 75 years, cut a double tooth. Unfortunately sufficient records are not forthcoming to enable us to determine whether later anomalies in dentition (as to time or order of eruption, etc.) are or are not associated with the presence of congenital teeth.

So far the local symptoms only of this dental anomaly have been considered; but according to certain writers general conditions may also be associated therewith. The majority of dentate new-born infants seem to have been delicate; at any rate many of them died soon after birth: at the seventh week from pneumonia in No. 33, at the same age from hæmorrhage following extraction of the teeth in No. 35, and at three months from infantile atrophy in No. 36. Other cases were delicate at first, and began to suffer from diarrhœa and atrophy, but recovered after the extraction of the teeth. In yet other instances (*e.g.*, Nos. 31, 32, 34, 57, etc.) the patients seem to have been quite healthy and robust.

The hæmorrhage which followed extraction in Magitot's case (35) must be ascribed to hæmophilia, although a hereditary history of the malady was wanting; it was most persistent, recurring on four separate occasions, and proving fatal, in spite of energetic measures, in about three weeks. This, however, would seem to be the only instance in which such a disastrous result followed the extraction of congenital teeth; generally they are quickly and easily drawn and leave no ill effects.

Some writers have seen in this dental anomaly an indication of a tubercular tendency, and in two or three of the recorded cases, including that seen by me (65), this idea received some support; but in the great majority of the observations there was no reference to any such predisposition. It has also been stated that the condition is associated with early closure of the cranial sutures and fontanelles (No. 45); but Jacobi (42) has never noted this, and Forchheimer (55) affirms that large fontanelles and diastatic sutures are quite as common. The possible association of early dentition and of an excessive development of hair has also been dwelt upon by some observers: in a female infant seen by Bartholin (11) there was a tuft of yellow hair on the left cheek as well as two congenital molars, and in one of the cases referred to Schurig (15) the presence of hair and teeth was noticed; but in recent observations there is little or nothing in support of this view.

There does not seem to be any correlation between mental activity and the presence of congenital teeth. Mattei's second patient (31*b*), a girl 5 years of age, was certainly precocious as regards her intelligence; but this is almost the only record of such an association. Probably the idea has been handed down from the time of Pliny (2), and has nothing but an historical interest. On

the other hand, defective mental action does not seem to be associated with premature eruption of the teeth any more than precocity of intellect. It cannot, in fact, be said that the dental anomaly has any prognostic value in estimating either mental or bodily vigour.

Morbid Anatomy.—Already some reference has been made to the characters of the congenitally erupted teeth. Usually they are but poorly developed. The absence of a root or fang has been often noted (*e.g.*, Nos. 23, 37, 42, and 48), and in some instances the enamel has been described as thin and imperfectly formed. Levison's observation (21) was quite peculiar in these respects, for in it the teeth were in a normal state as regards both the dentine and enamel, for the crowns as well as the perfect fangs were covered with well-formed enamel. In a few other cases the teeth were firmly fixed in the jaw, were white in colour, and had a firm consistence; but in the great majority they were quite movable, rocking backwards and forwards on the gum, lacked the bright white appearance of normal teeth, and had a softer feeling than usual.

Morbid conditions of the dental follicle were not uncommonly met with, and were of the nature of inflammation, ulceration, and even of gangrene; indeed, in one group of cases the premature eruption of the teeth was put down to these intra-follicular accidents.

In rare cases other malformations and anomalies were present in addition to the dental one. There were several facial and cranial defects in Bartholin's specimen (11); whilst in those seen by Ludovicus (12), Burdach (20), Melander (27), and Rotch (62), there was cleft palate, and in Vargas' case (64) there was a tongue-tie. The association of cyclopia and congenital tusk-like teeth (61) is probably quite accidental.

The observation of Vargas (64) had an exceptional morbid anatomy. In it not the tooth only, but the whole dental sac was extra-alveolar; it might be correctly named ectopia of the dental follicle. Dr Vargas at first regarded it as a neoplasm growing from the gum, and its true nature was only revealed during the operation for its removal. A case which closely resembled it has been recently put on record by Givel (63): a female infant, with three brothers with congenital inguinal hernia and one with hypospadias, showed on the lower jaw, just behind the lip, a cylindrical growth as large as the tip of the little finger; it had the colour of the buccal mucous membrane and a firm consistence, and was divided transversely into two parts by a slight groove. The growth was removed, and found to be a granuloma or a sarcoma in the first stage of development. Three days later an incisor tooth appeared in the position of the tumour, and was also removed; and now at the end of six years all the incisors are present, so that the one which was taken away must have been supernumerary. It is doubtful whether we can regard the cases of Vargas and Givel as identical in their pathology, but that they show some similarity, and may even be different stages in the same process, seems very

probable. They are, at any rate, quite unlike the usual cases of congenital teeth.

Pathogenesis.—All cases of congenital teeth do not admit of the same explanation, and it would seem that there are several ways in which their pathogenesis may be explained. Such a case as that reported by Vargas (64) is truly a malformation, and may be regarded as a displacement, an ectopia, of a dental sac, and possibly of a supernumerary one. It cannot therefore, strictly speaking, be regarded as an instance of premature eruption of a tooth.

The more ordinary cases of antenatal cutting of the teeth may be explained in various ways. Through the imperfect development of the tooth, and the absence of a fang to fix it deeply, it may more rapidly reach the surface of the gum and be extruded, soon to fall off on account of its rootless condition. In other cases, through the excessive development of a tooth or a too early deposit of calcareous material in it, the same ultimate result may be arrived at. Again, through an atrophic state of the gum, the tooth may be exposed before the natural time. Finally, intra-follicular inflammation may push a tooth upwards, whilst ulcer on the gum exposes its crown, and so this sort of eruption of it takes place. In one or other of these methods congenital teeth may arise, and possibly in some instances several of the pathogenetic factors are at work at the same time.

Treatment.—From what has been already said an idea of the treatment of congenital teeth will have been gained. Where the tooth or teeth give rise to trouble during lactation, either by wounding the nipple or by preventing the complete closure of the infant's mouth, removal with a small pair of forceps is indicated. This is usually easy of accomplishment, for they are seldom firmly fixed, and the danger of hæmorrhage from the socket, of which so much is made by Magitot (35), cannot be regarded as other than extraordinarily rare. Where also the teeth are freely movable, and are the cause of sublingual or buccal ulcerations, they ought likewise to be taken away. If, on the other hand, they give rise to no trouble they may be left *in situ*, for if removed there is always the possibility that other temporary teeth may not take their place, and so a gap be left till the period of the second dentition. In some cases they drop out of their own accord and do not need to be drawn.

General Conclusions.

1. Congenital teeth form a rare anomaly, but one which has long been known both to the profession and to the public.

2. Their presence has often an ill effect upon lactation, partly on account of the imperfect closure of the infant's mouth, and partly by the wounding of the mother's nipple; sublingual ulceration may also be a result, and infantile diarrhœa and atrophy are more distant consequences. Sometimes, however, symptoms are altogether absent.

3. Congenital teeth have probably little or no prognostic significance as regards the bodily or mental vigour of the infant carrying them.

4. The teeth usually met with are lower incisors, but sometimes upper incisors may be seen, and very rarely molars of either the upper or lower jaw. Other facial or buccal malformations may occasionally be met with.

5. They are caused by the premature occurrence of the processes which normally lead to the cutting of the milk teeth; in a few cases it would seem that the anomaly is due to a true ectopia of the dental follicle and its contained tooth.

6. In a few instances a hereditary history has been established.

7. As congenital teeth are usually incomplete and ill-developed, and likely to be more an inconvenience than an advantage to the infant, they are best removed soon after birth, an operation which can be easily, and, except in very rare instances, safely performed.

8. The occurrence of premature teeth in certain well-known historical personages is an interesting fact, the importance of which has been much exaggerated.

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66. BUIST (R. C.).—*Vide supra.*

MEETING VII.—MAY 13, 1896.

Prof. A. R. SIMPSON *in the Chair.*

I. THE following gentlemen were duly elected Ordinary Fellows of the Society:—Thomas F. Burton, M.B. C.M., Locksley, Helensburgh, and Robert M. Leith, M.B. C.M., Somerset East, Cape Colony.

II. *Dr J. W. Ballantyne* exhibited (for *Surg.-Capt. Charles H. Bedford*, D.Sc., M.D.) the following abortifacients in use in the Punjab:—

(*a.*) Abortion sticks or "buttees." The sticks are dressed with cotton wool, which is smeared with an irritant paste of nutmeg, arsenic, juice of Calotropis gigantea, jequirity seeds, sodium carbonate, aloes, etc., and then passed into the cervix uteri.

(*b.*) "Marking-nuts." These are the drupes of Semecarpus anacardium, of the natural order Anacardiceæ, vernacular name "Bhilawa." The juice is highly irritant. Are used (as an application to the cervix uteri) as an abortifacient in India, and also as a medicinal agent by the natives.

(*c.*) Root-bark of Calotropis gigantea (natural order, Asclepiadeæ). An exudation used medicinally in India, and also for effecting abortion, infanticide, and suicide. The juice is known in Hindustani as "ak" or "madâr."

(*d.*) Leaves, etc., of Nerium odorum (natural order, Apocynaceæ; Hindi name, "Kâner"). This is a spinal and cardiac poison used in India as an abortifacient. All parts of the plant are poisonous.

(*e.*) Fruit of Terminalia bellerica (natural order, Combretaceæ). It acts as a narcotico-irritant poison.

(*f.*) The roots and twigs of Plumbago rosea (natural order, Plumbagineæ; Hindi name, "Lal chitra"). Externally and internally it acts as an irritant. Is used as an abortifacient (rarely for homicidal poisoning) in India.

III. *Dr J. W. Ballantyne* exhibited an ANENCEPHALIC FŒTUS which one of his students had brought with him from Shropshire. The case had occurred in the practice of Dr W. Calwell of Wellington, who had kindly sent him the following notes of the clinical details:—The mother, 43 years of age, a ix.-para, was well developed mentally and physically. She had first had three children at intervals of about two years. The two eldest boys had convulsive attacks, apparently caused by slight febrile attacks; they were otherwise healthy. After a lapse of over seven years she began to bear again, and had six pregnancies. The first was normal; then came an abortion at about the third month, followed by a normal

pregnancy; then came a possible abortion at about the second month; then another normal pregnancy, followed by an abortion at the third month, in April 1895. The present pregnancy is believed to have followed a normal period early in September last. The delivery took place on April 22, 1896,—that is, at the seventh month. The infant presented by the feet, and there was *very little liquor amnii.* There was "partial" placenta prævia, which caused slight hæmorrhage for six weeks before labour. The placenta was small, and appeared normal; it was inserted over the posterior lip, mostly to the left side. The *family history* on the mother's side:—She and both her parents were total abstainers. Her husband was also a total abstainer, but his father had been very intemperate during his early life. Syphilis could not be traced, but was suspected, for out of the last six pregnancies the three living children have all suffered from convulsive attacks. No history of twins. The fœtus was a female, and showed the typical anencephalic malformation of the head. The vertebral canal was, however, closed from the cervical region downwards. Slight talipes.

IV. SOME MODIFICATIONS OF MIDWIFERY FORCEPS.

By G. Owen C. Mackness, M.D.

Before the principle of axis-traction by means of a supplementary handle was recognised and brought into common use, the ordinary handles of midwifery forceps played a far more important part than they at present do. Their function was twofold, viz.,—(i.) They served as a means for the introduction of the blades, and (ii.) they afforded a grip while traction was being exerted. In order to fulfil effectually this latter function, their construction was of necessity strong and large, in order that a firm grip of them might readily be obtained.

Later, when traction came to be exerted by means of the supplementary handle, the function of the original handles was still twofold, viz.,—(i.) As before, they served as a means for the introduction of the blades, and (ii.) they served as a guide for the axis of traction. Thus we see that while a new function is introduced, viz., as a guide for direction, the function that they principally fulfilled before, viz., as a means for the exertion of traction, is gone; and since it was for this latter use that they were made large, long, and cumbersome, therefore we see that the need for these large, heavy handles is gone, and all that we require are handles sufficiently long to enable us to apply the blades and to lock the forceps,—anything more than that being superfluous.

Some three or four years ago I was convinced that the ordinary handles were needlessly long and cumbersome, and consequently I got the forceps (Fig. 1) made. In them the handles are just half

FIG. I.

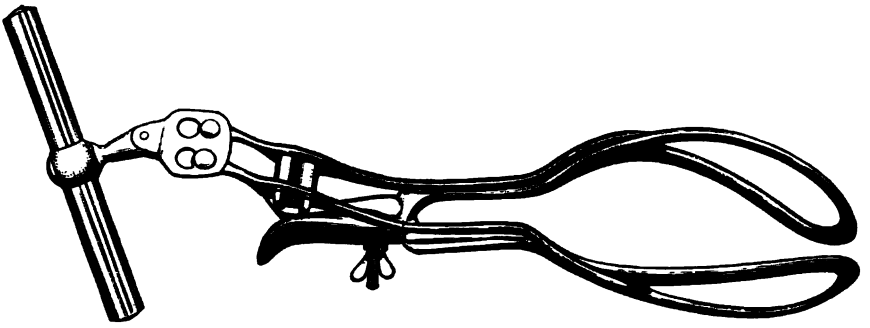
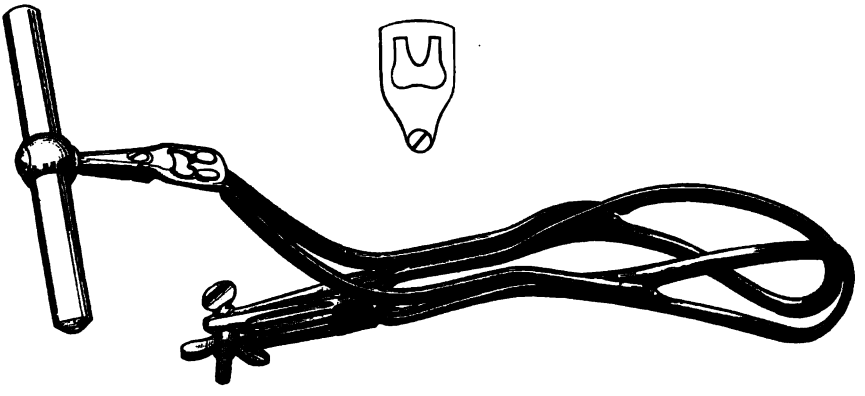


FIG. II.



the ordinary length, viz., 3 inches instead of 6 inches, and since that time I have never used any forceps with handles longer than 3 inches. Moreover, I have used them in a very large number of cases, applying the forceps frequently above the brim of the pelvis, and I can confidently assert that this length is amply sufficient.

The advantages of the shortened handles are as follow:—

(i.) The forceps are far lighter, less cumbersome, and more easily carried either in bag or pocket.

(ii.) When forceps have to be applied with the patient in a confined space—*e.g.*, in a box-bed or without skilled assistance to get her into and maintain her in a suitable position—then naturally the shorter the forceps the more easily they are manipulated.

(iii.) In occipito-posterior cases, where rotation has not occurred, as traction is made on the forceps rotation takes place, and the handles of the forceps tend to catch on the thigh of the patient—most often, of course, on the left thigh—necessitating their removal and reapplication. Obviously the longer the handles the sooner they will jam against the thigh, or, if the knees are well drawn up, against the bed, so that with long handles it may be necessary in some cases to remove and reapply the forceps more than once before delivery is effected. When the handles are short, as in my forceps, they naturally catch less, and may in some cases even be steered clear of the thigh altogether, in which case they will certainly not be obstructed by the bed.

(iv.) Further, as the handles are shortened, the centre of gravity of the forceps is brought much nearer the points of the blades—*i.e.*, nearer the point where the power is applied to the fœtus in exerting traction, and the balance of the forceps is thus much improved.

After delivery of the head of the fœtus by axis-traction forceps, there is often great difficulty in removing the traction-handle from the rods. This is due to the large size of the fœtal head, or to the fact that a normal head has been caught in a long axis,—*e.g.*, in a case of flat pelvis; the blades of the forceps are then widely separated, causing an approximation of the ends of the rods, and a consequent jamming of the buttons in the slots of the handle. To obviate this I at first used two catches a short distance apart on the rods, so as to keep the rods parallel whatever the distance apart of the points of the blades. Further, these catches consisted each of a button passing through a slit and turning so as to be retained in position (Fig. 1.) This arrangement works well, and can easily be rendered aseptic; its only drawback is that when the fingers are slippery the buttons are sometimes difficult to turn, a drawback that could, however, be easily obviated by roughening the buttons. I found, however, that there is no real need for any catch at all if the plate of the traction-handle is cut away as in the other forceps (Fig. 2), so that however much the buttons may

be approximated by the separation of the points of the blades, yet they can always slip out quite easily.

Further, the ordinary lock at the side of the handles is exceedingly difficult to keep clean, and in my own hands has broken more than once. It has therefore been shifted to the end of the handle, where it is fixed by a removable pin, so that it can easily be taken off and cleaned. The end of the handle is so shaped that the screw will fold back, and thus less room is taken up in carrying.

The fixed traction-rods stick out very much from the forceps, and are very liable to get strained and bent when the forceps are carried with other instruments in a bag; while if carried in the pocket they are extremely bulky, and are still more liable to be strained. I have therefore had these forceps (Fig. 2) made with detachable rods, which easily slip into position, and on being turned round are retained by a button. The angle at which this button is fixed to the rod and the direction of the slit has been carefully worked out, so that the rod does not slip out while the forceps are being applied. The forceps are thus much less bulky and more readily carried; moreover, they are very much more easy to clean, since the point where the rod was fixed to the blade was always a source of danger as a spot where dirt easily accumulated and was very difficult to dislodge, while it is especially necessary that this part should be clean, as it is frequently introduced into the uterus itself when the forceps are applied.

I have now used these forceps (Fig. 2) for some time, and find them to answer their purpose so well that I use no others. The detachable rods are, of course, a luxury, more or less; but I think that no one who gives the shortened handles a trial will ever go back to the long ones. Any length over the 3 inches is quite unnecessary for all practical purposes, and the long handles merely mark a stage in the evolution of the axis-traction forceps, showing how, first, there were ordinary long forceps with their big, heavy handles for pulling purposes; then how the principle of axis-traction was recognised, and traction-rods were fitted on existing forceps, while the big handles were retained although their principal function was gone.

The cutting away of the plate of the traction-handle will save endless trouble and often valuable time, as when the rapid removal of the forceps from the head of a partially asphyxiated fœtus makes all the difference as to whether its life is to be saved or lost. With this plate the handle can be removed at once and the blades separated; with the old one the buttons often jammed and much time was lost.

The forceps that I use, then, have handles only 3 inches long, roughened so that they do not slip in the hand; lock at the end of the handles, and removable; no lock to the traction-rods, but the plate of the traction-handle cut away as shown. The

traction rods may also be made removable for convenience in carrying.

These forceps have been made under my directions by Messrs J. Gardner & Son, Forrest Road, Edinburgh.

Prof. Simpson said he had listened with delight to the communication with which Dr Mackness had favoured the Society. The evolution of the forceps was a subject of perennial interest, and was still in progress. As regards the application handles, the Tarnier forceps which were first shown to this Society had the proximal ends turned outwards, representing a survival of the crotchets by which French obstetricians were in the habit of making traction in the old varieties of the instrument. Probably the shortening of these handles advocated by Dr Mackness might have advantages, but he (Prof. Simpson) had an impression that the ordinary length of handle gave greater facility in the manipulation of the forceps, especially in cases where there was some difficulty in locking the blades. The separability of the traction rods had been argued by Dr Mackness on satisfactory ground when he showed that the instrument could thus be more thoroughly cleansed, and the mode in which he had secured the easy removal and application of the rods to the blades seemed very simple and ingenious. The locking-plate also was of an entirely commendable construction; and he (Prof. Simpson) had no doubt the forceps which Dr Mackness had shown would prove a very serviceable and satisfactory instrument.

Dr Mackness thanked the Society for the reception of his paper, and expressed the desire that some of those who have large midwifery practice should give a trial to the shortened handles, feeling sure that if they did so they would not return to long ones.

V. TECHNIQUE OF THE DILATATION OF THE PERINEUM IN LABOUR.

By Dr G. Coromilas, Calamata, Greece.

(Communicated by Dr J. W. Ballantyne.)

I have the honour of communicating to the Edinburgh Obstetrical Society four cases illustrating the method of dilatation of the perineum which I prefer, in order that the Fellows may try it in protracted labours from rigidity of the perineum, and assure themselves of its effects.

I purposely say nothing in this paper concerning the anatomy and physiology of the perineum, vagina, and os uteri, nor do I as yet make any comparison between this method and the others which are in use at the present time, for I have not had sufficient opportunities to decide whether this procedure is the best and whether it hastens the delivery or not.

Position of Patient and Technique of Dilatation.—The woman should be placed in bed on her back or left side, with the legs as in natural labour. The mons, labia majora and minora, perineum, and vagina should be thoroughly washed and rendered aseptic. The accoucheur should wash his hands very thoroughly, and grease them with the following ointment:—

Vaseline, . .	50 grammes.
Cocaine, . . .	3 grammes.
Antipyrine, . .	3 grammes.

The perineum, vagina, and os uteri must also be anointed with the same ointment. The accoucheur then passes four fingers of one hand within the vaginal orifice, and makes some semilunar movements, first at one side and then at the other, so as to dilate the perineum. After having made three or four such powerful movements, he introduces the fingers of the other hand, and repeats the performance. When the requisite degree of dilatation is achieved, he then passes the fingers fully into the vagina until the index, middle, and ring fingers touch the os uteri, and makes again the same movements at the same time as he pushes the perineum outwards with the palmar surface of the hand. When he feels the presenting part pressing upon the dorsal surface of his fingers he must then withdraw his hand, and take on his other duties.

CASE I.—Mrs B., Calamata, aged 21 years, a iii.-para.

Previous History.—Menstruation always regular; had influenza four years ago; has had two children at the full time, and one miscarriage; she was four days in labour with her first child, and only a few hours with her second, when I for the first time performed dilatation of the perineum. She has suffered greatly since her last confinement (Sept. 7, 1894), and for the last two and a half months has been troubled with multiple abscesses on the surface of the body, which required to be opened and rendered aseptic. On this account she has not been able to walk, and has lost her appetite. Every day she has had one or two attacks of dizziness.

Present History.—The patient is emaciated and pale; the pulse is thready and rapid; the expansion of the lungs is good; the liver and spleen are hyperæmic; and the urine is normal. Three hours before my arrival the patient was seized with some regular but not very strong pains, and two hours before the membranes had ruptured. According to the midwife, a very small quantity of water had escaped. The child was always in the same place.

She was placed on her back after a vaginal injection had been given. I assured myself by palpation, auscultation, and digital touch that the membranes were ruptured, the liquor amnii escaped, and that the position was O.L.A. The external genitals and vagina were washed and rendered aseptic; afterwards I anointed them and my hands with this unguent:—

Vaseline,	. .	50 grammes.
Carbolic acid,	. .	1 gramme.
Iodoform,	. .	2 grammes.

I then began the dilatation. During the manœuvres, which lasted six minutes, the labour pains were regular, frequent, and very strong. The second stage was finished without any tears; but the patient suffered much pain during dilatation, and cried out, "Doctor, you tear me; you tear me!" The umbilical cord was twisted round the child's neck.

CASE II.—Mrs E., Calamata, 22 years of age, nervous, a i.-para. Menstruation irregular. On the 31st July 1894 I was called for the first time to see her by her sister. She was in a dirty hut, unattended by any midwife, and without any conveniences. She was in labour.

I prescribed carbolic lotion and the following ointment:—

Vaseline,	. .	50 grammes.
Antipyrine,	. .	5 grammes.
Cocaine,	. .	3 grammes.

The patient was placed upon her back. By an external examination the position was found to be O.D.P. The bag of membranes had formed, but had not yet ruptured.

I washed the external genitals and vagina, and then anointed them, as well as my hands, with the prescribed unguent; I then began the dilatation. After some semilunar movements the pains were stronger. I ruptured the membranes, and continued the dilatation. In seven minutes the delivery took place without the patient having felt severe pains, and without the least tear in the genital organs. Such tears, it may be said, are seen in all parturient patients in Messenia and Laconia, and are supposed to be natural.

CASE III.—Mrs K., Calamata, 20 years of age, a ii.-para, in very poor circumstances. I was sent for to attend her in a very dirty house. When I saw her (November 19, 1894) she was anæmic, pale, and emaciated, her tongue was slightly saburral, and her pulse was thready and rapid. The labour pains were feeble and few.

Eight hours before my arrival the membranes had ruptured, and the waters had escaped. The head presented in the O.L.A. position. Two large cicatrices were seen on the perineum and labia minora, due to her previous confinement, when the necessary precautions were not taken. There was rigidity of the perineum and contraction of the os uteri.

I washed the vulva and gave an intra-vaginal injection. Then I anointed the parts and my hands with this unguent:—

Vaseline,	. .	50 grammes.
Cocaine,	. .	3 grammes.
Antipyrine,	. .	5 grammes.

I began the dilatation of the perineum, and then put in the four fingers of my left hand and made the first semilunar movements. The expulsion of the child took place without the parturient patient having had severe pains. The delivery was completed without the least rupture.

CASE IV.—Mrs D. K., Calamata, 27 years of age, a iv.-para, nervous, and anæmic. She had suffered much in one of her previous confinements.

I saw her on May 2, 1895, at 5.30 A.M. She was in an exhausted state, with feeble labour pains. These pains had begun sixteen hours before my arrival, and had been strong for about eight hours.

The head was presenting in the left position, and the os uteri was the size of a penny. There was rigidity of the cervix, due to cicatricial contraction, caused by previous lacerations. There were three large cicatrices on the perineum and labia minora.

The vulva was washed and the vagina douched with a 3 per cent. solution of carbolic acid. At 7 A.M. the same condition of affairs was found, and another vaginal injection was given, and the perineum was dilated a little. The labour pains became stronger, but the cervix was still undilated. At 7.30 the labia majora and minora, the perineum, the vagina, and the os uteri were all anointed with the following unguent:—

Vaseline,	. .	50 grammes.
Cocaine,	. .	2·50 centigrammes.
Antipyrine,	. .	3 grammes.

At twenty minutes to 8 o'clock I anointed my hands with the same, and again applied it to the vagina and os uteri. I began the dilatation of the perineum, but before it was completed the delivery had taken place (at three minutes to 8 o'clock).

I venture to think that by this manœuvre we can guard the perineum and the labia majora and minora from the rupture which happens so frequently, and that we can hasten the emptying of the uterus. Thanks to the physiological action of cocaine and antipyrine, the dilatation of the perineum and the delivery occur without severe pains, as is clearly shown by the above case-records. I say nothing (from literature) recording the local narcotic action of cocaine on the female genital organs, for this paper is merely a brief summary of my own small experience in the dilatation of the perineum during labour.

Dr James Ritchie proposed that the Senior Secretary be instructed to convey to Dr Coromilas the thanks of the Society for his in-

teresting paper. Regarding the advisability of dilating the perineum, he did not approve of its routine use, but, in view of the natural effects of pressure of the fœtal head on the perineum, he had, in some cases of lingering labour in consequence of feeble pains, made careful dilatation of the perineum, with the result that the strength of the pains had been increased.

Dr Church thought that obstetricians should insist on the thorough antiseptic cleansing of the external genitals before labour, as mentioned in Dr Coromilas' paper. The speaker found in practice that hot antiseptic fomentations, besides rendering the perineum more elastic, reflexly induced uterine contractions. By this simple means, therefore, the pains were increased, the perineum softened, and antisepsis carried out.

Prof. Simpson said the Secretary would convey to Dr Coromilas the thanks of the Society for the communication he had kindly sent. Probably the most valuable element of the paper was the demonstration of the value of a cocainised ointment in aiding the relaxation of the tissues in cases of rigid perineum, and in rendering them insensible to the pain that would attend attempts at artificial dilatation.

VI. CRIMINAL ABORTION IN THE PUNJAB.

By Surg.-Capt. CHARLES H. BEDFORD, D.Sc., M.D., I.M.S., formerly Professor of Chemistry and Toxicology, Lahore Medical College (Punjab University), and Chemical Examiner to the Punjab Government.

Communicated by Dr J. W. BALLANTYNE.

THE cases which form the basis of the following paper came under my official notice as Chemical Examiner for the Punjab from November 1893 to November 1894, *i.e.*, during the time I held that office. The facts detailed are derived—(1) from notes made by me on the official documents forwarded by the local medical officers and subordinates, as well as by the police, the main source being from the post-mortem and symptomatological reports of the medical men who conducted the treatment and post-mortem inspection of the cases; and (2) the macroscopic, microscopic, and chemical conditions noted by me in the articles sent to me for examination and analysis.

Police Procedure in Abortion Cases.

When a case of suspected criminal abortion occurring in the Punjab comes to the knowledge of the police, they request the Government medical officer (civil surgeon) of the town or district to examine the patient; and, if death has resulted, to submit to them a report on the post-mortem conditions present, and an opinion as to the cause of death. If the civil surgeon, in the

course of the inquiry, meets with appearances suspicious of abortion, he arranges with the police to forward to the chemical examiner of the province such of the viscera as it may be deemed necessary to send, for the purpose of having them examined and analysed for poisonous substances which may be present in them. Any suspicious drugs or agents by which abortion might have been procured are also sent for examination along with the viscera. There is a routine way of securely sealing the packages containing the viscera, and the steps to be taken in forwarding articles for examination to the chemical examiner are fully detailed in the printed orders passed by the Government of the province in question.

Chemical Examiner's Procedure.

When the chemical examiner receives articles for examination in such cases, his first step is to carefully read through the documentary evidence in connexion with the case, in order that, if possible, directive information may be obtained as to the abortifacient to be searched for in the case under reference. The package is then carefully examined externally for any signs which may be present to indicate that it has been tampered with in transit, and the impressions on each seal on the package are compared with the sample seal sent separately by letter-post, along with the documents in connexion with the case. This concluded, the chemico-microscopical examination is then conducted, and the results are stated in an official report which is despatched to the forwarding officer—medical or police. The chemical examiner does not appear in Court to be cross-examined on his report. The interpretation to the Court of the facts of the report is the duty of the *local medical officer.*

The information to be derived from the documents forwarded to the chemical examiner in connexion with many cases is frequently of too vague a character to be of any assistance to him in directing his search for the particular abortifacient used. And when, as not unfrequently happens in a fatal case, the forwarding officer omits to send the uterus and upper portion of the vagina, the search for abortifacients is often futile.

General Remarks on the Abortion Cases referred.

Twenty-six cases in all were referred to me during the twelve months under consideration, and in *all* of these (except two references in which suspected drugs alone were sent) death had occurred. It is very probable that these 24 cases only represent a very small fraction of the fatal cases of criminal abortion occurring in the Punjab, and an infinitely smaller proportion of the non-fatal cases. Of course, the same remark might be made

with regard to nearly every community, but it is safe to say that, *relatively*, the statement just made applies with greater force to India than to most civilised countries. The average Indian native woman is very poor and too ignorant to adopt "preventive checks," and she falls back the more readily on abortion as an easier way (to her) out of her troubles. It is, however, not so much among the married as among the illegitimately pregnant that abortion is practised. Widows, debarred by the social custom of the country from remarrying and who find themselves pregnant, are the principal offenders, so far as my experience goes. The reason which, to my mind, best accounts for the uniform fatality of all cases which have been referred to me is that, in outlying districts and in densely-crowded cities, only fatal cases *come to police notice*. A woman procures abortion; she suffers subsequently from pyrexia from sepsis, she recovers, and says that she had an attack of "fever"—understood as malarial fever by the neighbours. Or she dies, and her death may be attributed to the same cause; and, in the case of a Hindu, on the same day her body is partially burnt and thrown into the nearest large river (when the relatives can afford it the body is wholly incinerated). Unless a complaint has been directly lodged with the police (and this few care to do, for reasons known to residents in India), the "corpus delicti" is in ashes, or miles down the river, or undergoing the process of digestion in the alimentary canals of sundry fish or alligators, before any legal steps can be taken in the matter. In the case of Muhammadans the body would be disinterred. Many of the cases referred have come to the notice of the police *viâ* common rumour,—probably started while the case was yet alive,—and steps have been taken to prevent the burial or burning of the body without its having first undergone the "ordeal by autopsy."

Comparison with Numbers received in two previous years.

Twenty-six cases were referred during the twelve months I am dealing with. For the preceding year 17 cases were sent up for examination to the Chemical Examiner for the Punjab, and in the year before that only 7, so that the increase is a substantial one, and, I think, goes to show better police surveillance, and not an actual increase in crime.

General Means Employed.

In India the instrument which is used locally to procure abortion is generally medicated with some irritant chemical substance. The safety of simplicity is not known or appreciated. If it *were* known that the detachment of the membranes adjacent to the os by finger or bougie was all that was necessary, the knowledge

would, in the vast majority of cases, be comparatively useless in the hands of people ignorant of the anatomy of the parts, of the best means of dilating the cervix for the purpose of introducing into the uterus the finger or bougie, and of the manipulative dexterity requisite to the accomplishment of the procedure with the minimum of danger to the patient. We must remember that in the Punjab knowledge of the means of procuring abortion rests in the main with native nurses (dhais), with native "midwives," or with male native quacks, and these all share the common attribute of intense ignorance, and are blinded, further, by rigid conservatism in favour of methods which have been, no doubt, in use in India for hundreds of years.

The production of abortion by the administration of substances by the stomach, which may induce abortion by acting as drastic purgatives or by causing profound constitutional disturbances, is less common than by local means, the preference being no doubt based on observation of the uncertainty of general as compared with local abortifacients.

Legal Aspects of Criminal Abortion in India.

India has the great advantage of a Penal Code, founded, no doubt, on the celebrated "Code Napoléon," and sections 312, 313, and 314 deal with this crime.

"312. Whoever voluntarily causes a woman with child to miscarry shall, if such miscarriage be not caused in good faith for the purpose of saving the life of the woman, be punished with imprisonment of either description[1] for a term which may extend to three years, or with fine, or with both; and if the woman be quick with child, shall be punished with imprisonment of either description for a term which may extend to seven years, and shall also be liable to a fine.

"*Explanation.*—A woman who causes herself to miscarry is within the meaning of this section.

"313. Whoever commits the offence defined in the last preceding section without the consent of the woman, whether the woman is quick with child or not, shall be punished with transportation for life, or with imprisonment of either description, which may extend to ten years, and shall also be liable to fine.

"314. Whoever, with intent to cause the miscarriage of a woman with child, does any act which causes the death of such woman, shall be punished with imprisonment of either description, for a term which may extend to ten years, and shall also be liable to fine; and if the act is done without the consent of the woman, shall be punished either with transportation for life or with the punishment above mentioned.

[1] *I.e.*, "ordinary," or "rigorous" (*i.e.*, hard labour).

"*Explanation.*—It is not essential to this offence that the offender shall know that the act is likely to cause death."

If the attempt be made by the administration of an "unwholesome drug or other thing," the case may be dealt with under section 328, which deals with attempts to poison. In England criminal abortion is punishable under sects. 58 and 59 of 24 and 25 Vict. c. 100, as amended by 27 and 28 Vict. c. 47. These sections do not, like the Indian ones, infer that want of the woman's consent aggravates the offence; there is, besides, no question of quickening raised; moreover, it is only when a woman is accused of procuring abortion on herself that the question of pregnancy arises; and, lastly, if the child or woman dies as the result of the attempt, the case is dealt with as one of ordinary homicide. It will thus be seen that the Indian code takes, as compared with the English statute-book, a fuller view of the crime in question.

Division of the Subject.

Accidental or justifiable abortion forms no part of our subject; the following division of the subject of criminal abortion[1] (which alone engages our attention in this paper) will be observed From the point of view of the *civil surgeon* who attends the case or performs the autopsy, the examination consists of—(1) That of the alleged uterine products; (2) the symptoms of the case during life; (3) the cause of the abortion—natural or criminal; (4) the appearances at the autopsy of (*a*) the body generally and viscera other than those of the reproductive system, and (*b*) of the reproductive organs—internal and external. The question of the employment of general or local means will also have to be considered by him.

The chemical examiner is concerned alone with the examination and analysis of substances found in the genital tract or of agents alleged to have been used to procure abortion by general or local action.

General Means[2] (apart from shocks by blow or fall, abdominal bandaging, etc).—Emetics, purgatives, ecbolics, irritants, emmenagogues, and substances coming under none of these heads, may be employed in India for the purpose of inducing abortion.

Local Means.—In India generally consist in the introduction into the os of some irritant twig or bougie (medicated); or in endeavours to procure the end in view by the application to the cervix of irritant substances in the form of a paste by the finger, or on cotton wool, etc. Death may be caused—(*a*) By the

[1] The term "miscarriage" covers, in law, both "abortion" and "premature labour"—the latter term referring to the abortion of a viable child.

[2] Venesection as a cause of abortion has the authority of Hippocrates, but it is now an exploded idea. Bleeding to *stop* impending abortion used to be commonly practised.

abortion being followed by one or other of the usual causes of death in ordinary miscarriage; or (*b*) by peritonitis directly induced by mechanical injury to, or even perforation of, the womb.

The examination of the facts in my possession with regard to the 26 cases under consideration will best be conducted under the following headings:—(*a*) Abortifacient substances employed; (*b*) Ages of deceased females; (*c*) Condition (married, single, or widowed); (*d*) Self-induced, or, if not, by whom?; (*e*) Age of pregnancy; (*f*) Attempt by local or general means; (*g*) Cause of death; (*h*) Death, but not abortion, produced; (*i*) Abortion produced; (*k*) Signs of mechanical injury to reproductive organs; (*l*) Distribution of cases; (*m*) Post-mortem and other details of cases not included under other headings.

(*a.*) *Abortifacient Substances employed.*—Out of the total number of 26 cases:—Portions of twigs or battis,[1] four cases; nutmeg detected, four cases; opium only detected in two cases; arsenic detected in four cases; crude carbonate of sodium ("sajji"), black pepper, mercury, croton and aloes, alum, saffron, each once; no poisonous or irritant substance detected, three (in two of these the uterus was not forwarded to me); suspected drugs, two.

Battis (pronounced "buttee.") The longest of the specimens shown is composed of a stem dressed (just as a uterine sound would be) with cotton wool, and the whole was then—in this case—smeared over with a paste of pounded nutmeg. (This substance probably owes its irritant properties, such as they are, to a solid glyceride of myristic acid [$C_{14}H_{28}O_2$], which is a constituent of its concrete oil; and to the terpene and myristicol [an oxygenated oil], which chiefly go to form its volatile oil.) But, of course, it is an unnecessary refinement (!) to use nutmeg paste at all. The mechanical irritation of the piece of stick (which, in the attempts at introduction through the os, will also probably have ruptured the membranes) being quite sufficient for the purpose in view. The head of another "batti" exhibited is medicated, in the same way as the one just shown, but with arsenic instead of nutmeg.

Other substances used on the battis are pulped jequirity, vern. name, "ratti" (Abrus precatorius) seeds; "madâr" (Calotropis procera or gigantea) juice; capsicum seeds, pounded to a paste; croton seeds, often mixed with mineral irritants, such as arsenious acid, cupric sulphate; impure carbonate of potash (as well as impure sodium carbonate, already referred to); quicklime. These substances may be used also to smear the cotton-wool pledgets referred to in this paper. These pledgets are pushed up the vagina with the finger to the os, and left there. This is a safer means than the "batti" for the woman, but not so certain of producing miscarriage.

"Battis" are occasionally prepared as follows:—The end of the

[1] "Batti" is the Hindustani (Urda) for a candle (compare French *bougie*, used in a similar connexion).

twig is dressed with cotton wool, dipped into spirits of wine or coarse country spirit, and then smeared with a mixture of aloes, lime, impure sod. carb., and nutmeg. More cotton wool is applied over this, and then the "batti" is again treated with spirit and the above-mentioned mixture of drugs. It is then passed into the cervical canal, left a few minutes, withdrawn, and more cotton wool is applied; this is recharged with the before-mentioned irritant substances, and is passed again into the os. This procedure is repeated until the os has been dilated sufficiently to allow two fingers to pass (the dilatation being effected mainly by the mechanical dilatation of the gradually thickened batti-end, though when uterine contractions set in there is added a certain amount of physiological dilatation), and then the membranes are ruptured. Friction to the abdomen is now applied, and abortion follows. This method requires some degree of skill to apply, and I have not met with an example of it, although it is certainly occasionally employed in the Punjab.

Another modification employed is to pass three or four "battis," one by one—leaving each preceding one in the cervical canal—in order to dilate the os sufficiently for a finger to be passed, in order to rupture the membranes.

Another plan which has been recorded is to fix a piece of arsenious acid to the end of a twig, which is then passed up to the os, and left there. Of course, the action of this is caustic; very severe local reaction follows, but abortion is uncertain. It is certainly a very exceptional method of attempting to procure abortion. The batti medicated with arsenic which is shown to-night exemplifies this use of arsenic in a milder form.

Marking-nut juice has been used, applied on a cotton-wool pledget to the os. It is an uncertain abortifacient measure, as is also the employment of the latex of various euphorbias. *Red lead* (minium, Pb_3O_4) has been used, often along with yellow, white, or red arsenic, as a paste for medicating "battis."

The *stems* of the battis are generally twigs of oleanders (Nerium odorum and Cerbera thevetia), euphorbias (E. Tirucalli especially), and of Lal Chitra (Plumbago rosea and P. zeylanica), and, lastly, of Chiretta.

I show you a specimen of Lal Chitra (Plumbago rosea, N.O. Plumbagineæ), which is frequently used, in the form of a paste made from the pounded roots, for medicating batti-heads; as also for introduction as a twig into the uterus. Internally, this substance acts as a narcotico-irritant poison, if taken in a sufficiently large quantity. Dr Chevers, late of Calcutta, mentions at p. 252 of his classical work on *Indian Medical Jurisprudence*, two cases of poisoning by means of Lal Chitra—one with murderous intent. Applied to the skin, it acts as a violent irritant and vesicant.

Another vegetable abortifacient used in India is the *Marking nut* (Semicarpus anacardium, N.O. Anacardiaceæ; vern. name,

"Bhilawa"), of which specimens are now exhibited. The juice from the bruised nuts is highly irritant, blistering the parts of the body to which it is applied. Besides its interest as an abortifacient, it is noteworthy that it is frequently employed in aiding the fabrication of false charges of assault, as, when rubbed on the skin, the diluted juice produces somewhat the appearances of bruising. It can generally be distinguished from a bruise by the black blisters which it raises, and, in many cases, by causing a papular or eczematous eruption. Given by the mouth—as it is by native empirics for remedial purposes—its contact-effects are much feebler than if externally applied. The juice has been used to cause disfigurement by being thrown in the face, just as in the case of the familiar crime of vitriol-throwing. Chevers also mentions its use by malingerers to produce skin-eruptions and conjunctivitis. Dr Gray of Bombay[1] met with a case in which a man placed three marking nuts in his wife's vagina, as punishment for adultery.

Nerium odorum (N.O. Apocynaceæ; vern. name, "Kaner"—pron. Cun-air), is an oleander, acting powerfully as a spinal and cardiac poison. It is only occasionally employed for poisoning, and very rarely as an abortifacient. I show some leaves and twigs of it, all parts of the plant being poisonous.

Lastly, *Calotropis gigantea* (N.O. Asclepiadeæ) is a well-known abortifacient among natives. It is the juice known as "ak" (pron. uck), or madar (pron. mud âhr), and got by exudation from the leaves and stalks, which is used. It is employed medicinally by natives and domestically as a depilatory. As an instrument for effecting crime, its two principal uses are in infanticide and abortion: it has been used for suicidal purposes, being taken internally. As an abortifacient, it is given either by the mouth or as a topical application, and often in both ways. The specimen shown is the root-bark.

(*b.*) *Ages of the deceased Females.*—16 years of age, one; 18, two; 20, one; 25, three.

Among Muhammadans abortion appears to be somewhat less common than among Hindus (no doubt on account of the prohibition of Hindu widows from remarrying).[2]

(*c.*) *Condition (married, single, or widowed).*—In only five cases this information is given: three of these were widows; one was married, and was stated to have been pregnant by a man other than her husband; and one was single. In the remaining cases no indications on the subject are given.

(*d.*) *Self-induced, or, if not, by whom?*—In seven cases (one of which was probably suicidal, abortion being secondarily induced) abortion was self-induced. In 13 cases there was very strong *presumptive* evidence that the abortion was not self-induced. In four cases it

[1] Lyon's *Medical Jurisprudence for India*, 1889, p. 377.

[2] In the remaining cases the ages are not recorded in the documents forwarded to me.

was *certainly* not self-induced (in one it was procured by the man by whom deceased was pregnant, and in three by other women—in one case at the instigation of the paramour of the deceased). In one case it was uncertain whether the abortion was self-induced or not.

(*e.*) *Age of Pregnancy.*—Out of 24 cases,[1] four occurred at the *third* month, or a percentage of 16·6; eight at the *fourth* month, or 33·3 per cent.; five at the *fifth* month, or 20 per cent.; and one at the *sixth* month, or 4 per cent. In six cases no data were given by which the age of the pregnancy could be determined by me. In 12 of these cases the estimation has been made by me from the uterine measurements noted in the post-mortem reports forwarded in connexion with the cases. As will be seen, the fourth month, then the fifth, and then the third, would (from these figures—not, it is to be noted, a very broad basis for deductions) appear to be, in order, the periods at which abortion is most frequently attempted.

(*f.*) *Attempt by Local or General Means.*—(i.) *Local:* in 13 instances. In two of these by regular "battis"; in one, a portion of twig was found penetrating the uterus at its junction with the cervix; in another, the uterine wall had been penetrated by some hard stem, and the cotton wool which had dressed the stem was found—soaked in crude sod. carb. solution—in the uterine wound; again, a piece of twig was found in the cavity of the womb. In two cases pledgets medicated with arsenic were found in the cervix or uterine cavity. Nutmeg paste was detected on the cervix in another case. In another the wool pledget was medicated with saffron, and in another a cotton-wool pledget found in the vagina was found to have been smeared with a paste of pounded croton seeds and alum. (ii.) *General:* In 11 cases. In three of these the particular substance used was not separated, but the symptoms and post-mortem signs show that the agent employed had been administered by the mouth and not topically.

The general or constitutional measures adopted were as follows:—(i.) Mercury was detected in the stomach contents and liver of one case; (ii.) Arsenic was separated from the stomach and contents, liver and kidneys in another; (iii.) Powdered black pepper was found in large amounts in the stomach of a third case (this shows either an attempt to procure abortion or that the pepper was taken for gastro-intestinal symptoms, as it often is by natives); (iv.) Aconite and opium were the cause of death in another case of attempted abortion (not suicidal); (v.) Nutmeg[2] was found in

[1] No references. There were, it will be remembered, two more references in which drugs, etc., alone, and no viscera or post-mortem reports, were received.

[2] It is also used by natives as a carminative and stimulant. But an ignorant native woman desirous of procuring abortion is not given to profound ratiocination as to the pharmacological effects of any drug proposed to her as an abortive.

the stomach and contents, and in the fæces (it was proved to have been taken to procure abortion, though its action as an abortifacient when taken by the mouth is very improbable); (vi.) Opium caused death in this case, being detected in lethal amounts in the stomach and contents and liver,—the woman probably committed suicide by opium, and did not take the opium with the intent to procure abortion (which is just as well (!), for disappointment would have been the result had it been used for the latter purpose); (vii.) Another case of opium poisoning (suicidal) in a woman illegitimately pregnant.

In addition to the poisons used either generally or locally as arbortifacients which have been already referred to, and of which specimens were exhibited, the following are occasionally employed for the purpose in India:—*Purgatives:* Gamboge, aloes, croton seeds, calomel, etc. These are, of course, all uncertain in their abortifacient effects. *Irritants, stimulants, and astringents:* Garlic, cardamums, asafœtida, alum, and also a decoction of Luffa echinata, which causes great nausea, vomiting, and dilatation of the os uteri; also arsenic, saffron, "săn" (Crotalaria juncea),—the action of the two latter being more than open to doubt. Auto-suggestion would best explain *their* action as abortives.

It should be added that the action of such substances as calomel, aloes, croton, and gamboge is generally enhanced by the native practice of vigorously shampooing the abdomen after the administration of these drugs for a criminal purpose, the direct stimulation of the uterus by friction coming to the aid of the reflex irritation produced by the cathartic or drastic administration.

(*g.*) *Cause of Death.*—The cause is generally not stated in the documents, but it may in many instances be safely inferred from the description of the symptoms and post-mortem appearances:—Septicæmia, seven; peritonitis, three—in one case from perforation of uterus, and in another a "batti" was found in the uterine cavity; both septicæmia and peritonitis, one; drug poisoning, three—two of opium and one a compound case of poisoning by aconite and opium. In eight the cause of death could not be determined with certainty,—crotalaria juncea being the alleged cause in one case, and in two cases there were no data whatever supplied.

(*h.*) *Death, but not Abortion, produced.*—In only *two* instances did this occur. The first was a case in which "Lal Chitra" was detected on "battis" found in the uterine cavity close to the os internum. A female fœtus at the sixth month was found in the uterus. The case will be fully detailed later. The second case was one in which the woman herself made the attempt to produce miscarriage. She was four months pregnant, and she took mercury by the mouth in fatal quantity, dying after exhibiting typical symptoms of irritant poisoning. The fœtus was expelled after death by pressure of putrefactive gases formed in the abdomen.

(*i.*) *Abortion produced.*—In 20 cases abortion followed, but death

ensued in all. *All* of these cases (except one at four months) were under six months pregnant. The oldest pregnancy noted was that in which attempts to produce miscarriage were unsuccessful. In two instances it is quite uncertain from the documents as to whether abortion was or was not produced. It will be unnecessary to refer to the relative success in producing miscarriage of the various agents employed. There was—except in the cases alluded to at (*h.*)—much success attained with the different means employed in emptying the uterus, but these, unfortunately, were no less successful in killing the women.

(*k.*) *Signs of Mechanical Injury to Reproductive Organs.*—In nine cases there were signs either of direct mechanical injury or of local injuries, or conditions which were more likely to have been produced by violence than by the normal pathological causes which might be present in cases of natural abortion.[1] *One* case had the cervical and uterine mucosa inflamed, and the peritoneal coat of the womb also; the fœtus (six months) was *in utero*, but the membranes were ruptured; and "battis" were found in the uterine cavity. In a *second* case the uterine wall was perforated by a "batti," and much pelvic peritonitis was present. In a *third* case pelvic peritonitis was very marked (of course, it may have been of septic origin only). In a *fourth* the vagina was much congested. In a *fifth* the os was patulous, and it and the fourchette were lacerated. This, of course, might be explained as due to the delivery of the five months' old fœtus[2] in this case, but it seems just as likely that the rupture was caused by clumsy efforts to dilate the cervix or to pass instruments through it; in any case, it is indeterminate. In a *sixth* the os was lacerated and patulous. In this case an attempt had been made to place a cotton-wool pledget in the cervix,—the presence of a four months' fœtus in this case lends probability to traumatism as the cause of the lesions. In a *seventh* the right uterine cornu was blackened (? by decomposition; if so, the decomposition at this point would be more marked because of the antecedent inflammation there), and was perforated by a twig, 5 inches long, found lying in the uterine cavity and fixed into the fracture. This exemplifies a cause of death in many of these abortion-stick ("batti") cases; the stick is passed into the uterus without, perhaps, wounding or perforating the walls; the fœtus is expelled, but the early contractions of the uterus for this purpose do not often expel the foreign body, which is generally driven through the fundus by the contractions of the

[1] Nos. 3, 4, 5, and 9 are doubtful, but it is more convenient to class them as I have done, as the probability in each case was much more for local injury than for ordinary septic effects as a cause of the morbid signs present.

[2] I speak with much diffidence on the point of rupture of the cervix by four and five month fœtuses; but, in my limited experience of abortions *at these periods*, I have never yet seen the cervix ruptured by the passage of the fœtus through it.

uterus on it. Death in this case was from peritonitis and septicæmia. In the pelvis there was found some bloody fluid. In the *eighth* case the vulva was swollen and the vagina congested; and in the *ninth* case the mucous membrane of the uterus was much congested.

In 13 cases there were no signs of mechanical injury present, and in the remaining two the data supplied were insufficient to found any opinion on.

(*l.*) *Distribution* (*i.e., throughout the Punjab*) *of fatal cases referred.*—Chakwal contributed three cases; Gurdaspur, Jullundur, Sealkote, Pind Dadan Khan, Rawalpindi, Umballa, Multan, each two; Ferozepur, Ludhiana, Jhang, Jhilam, Dera Ismail Khan, Hoshiarpur, and Gurgaon, each one. There is a point of interest in connexion with the cases from Chakwal and Sealkote, in that the first two from Chakwal as well as both those from Sealkote occurred very rapidly one after the other. This suggests the *possibility* that the second cases were the work of the abortion-mongers who were responsible for the first two cases in each place. (There was no self-induction of the abortion in any of these four cases.)

It only remains now to detail the individual cases more or less fully as the circumstances demand in each particular case.

(*m.*) *Post-mortem and other details of cases not included under preceding headings.*

I. *By General Means.*

(1.) *Symptoms.*—Stated to have been ill for three or four days; fever; headache; hæmorrhage from vagina; no mark of injury to pudenda or vagina; breasts not full; linea albicantes on breasts and lower part of abdomen; pupils dilated (? from anæmia due to hæmorrhage). *Post-mortem:* Cerebral membranes slightly engorged with blood. Both lungs turgid; no consolidation. A small amount of clotted blood in both heart ventricles. Gastro-intestinal tract normal. Vulva, no marks of injury; vagina somewhat dilated. Uterus enlarged, and contains large blood-clot; its mucosa is thickened and ulcerated (old ulcers); weighs 4 ozs.

(2.) This case was one of suicide by opium, the deceased being "illegitimately" pregnant. No symptoms detailed. *P.-M. Report.*—Body generally very anæmic. Teeth clenched. Rigor mortis in arms (time of death and of examination not given). Right hand clenched with thumb below fingers (? "fit" before death, or from rigor mortis). Lungs intensely engorged with dark fluid blood. Right heart empty (? by gaseous pressure from abdomen). Left side also empty. Stomach contained about 3 ozs. of dark brown fluid, with slight opium-odour. Otherwise healthy. Brain and membranes normal (congestion—particularly of the meninges—is the rule in death from opium). Small intestine healthy and empty. Large intestine—mucosa congested just above cæcum. Right kidney congested. Bladder contained some urine. *Reproductive*

System.—No external marks of violence on pudenda, etc. Vagina healthy. Cervix would not admit the little finger. Uterus, 6¼ ozs., 3 inches long, 2 inches broad (therefore pregnancy had probably reached the third month.) The endometrium was congested, and a small part of the superior posterior surface was raised, roughened, and denuded (placental site). Uterus contained small shreds of coagulated blood.

(3.) *Aconite and Opium Case.*—Widow, whose stomach and contents, liver and uterus, with cervix and upper portion of vagina, were forwarded to me, and in the first three of which I detected aconite and opium, as well as, in the uterus, opium alone. *Symptoms.*—Two hours after her last meal of rice, milk, and sugar she suffered from bitter taste in mouth, food tasteless, sense of obstruction in the throat, headache, giddiness; vomited thrice, faint, paresis of limbs, great restlessness, tickling at nape of neck, insensibility, with intervals of consciousness, gastric pain, purged twice, convulsions, death.

P.-M. (time after death not stated).—Rigor going off; old adhesions right pleura. Right ventricle contained some dark blood. Tonsils not swollen or enlarged (the relatives had advanced the idea of death from tonsillitis). Stomach contained *c.* 5 ozs. of very black (from opium) liquid, and a good deal of mucus; no food. No congestion of mucosa. Liver slightly congested. Spleen—firm, enlarged, 16½ ozs. *Reproductive System.*—No sign of mechanical injury to pudenda, vagina, or uterus. Uterus externally inflamed, and contained blood-clot and immature, adherent placenta. Pregnancy at the third month.

(4.) Mussulman female, æt. 18; no symptoms given. I detected nutmeg in the stomach, its contents, and in the fæces.

P.-M. (thirteen hours after death).—Abdomen distended with gas, and peritoneal sac contained some opaque fluid. Stomach and intestines contained much thick, dark-brownish fluid. Mucosa of both pale and normal. Uterus enlarged, 5 inches broad and 7 inches long (therefore about the beginning of the fifth month). Walls thickened. Endometrium covered with shreds of greenish membrane. No fœtus found *in utero.* No fresh clots.

(5.) No substance likely to be used as an abortive was detected in the stomach and contents and portion of the intestines and liver sent to me in connexion with this case, but as the abortion was induced, and no local signs were noted, the case is classed as "general."

P.-M. (time not stated).—Brain membranes congested, also right cerebral hemisphere (whether on surface or on section is not specified). Each pleural cavity contained *c.* ½ pint blood. Pleuræ slightly congested. Right heart contained clotted blood. Stomach nearly full of yellow bile. *Reproductive System.*—Breasts enlarged. Uterus empty, but had recently contained a fœtus; weight, 19 ozs.; length, 6¼ inches; breadth, 5½ inches (therefore at fourth month).

(6.) Stomach, liver, spleen, and kidney forwarded. Large quantity of black pepper found in stomach.

P.-M. (no time given). Age, 25. Pleural adhesions (old) on both sides. Both lungs hypostatically congested. *Reproductive System.*—Vagina dilated, and contained clotted blood. No wounds or signs of violence. Uterus enlarged, soft, and dark-coloured (early decomposition; the uterus is said to be the viscus which of all others decomposes slowest). Pregnancy advanced to between fourth and fifth months. Womb contained clots, and presented the usual puerperal characters.

(7.) Woman, aged 25. Mercury detected in the stomach contents and liver, but not in the uterus. Self-induced case. Died without aborting, the fœtus being expelled after death (by gaseous distension of abdomen).

Symptoms.—Stated to have had fever for four days before death. Her last meal consisted of wheaten bread, dal (a kind of pulse), and milk; eight hours after she suffered from restlessness, complained of thirst, headache, and much gastric pain. She suffered from severe purging. Fainted, but on recovery remained sensible till time of death.

P.-M. (no time stated).—Stomach normal, and contained some food of very yellow colour (? bile-stained). Vagina dilated *and inflamed.* Uterus about fourth month of gestation. Endometrium "corroded." Appendages much inflamed.

(8.) This case (in whose house some nutmeg-paste was found by the police) apparently died from an attempt to procure abortion by general means. The post-mortem report only details the dimensions of the uterus, 3½ inches long, 2½ inches broad, 3 ozs. in weight (the pregnancy would, therefore, have advanced to the third month).

(9.) ? *Suicide by Opium.*—No symptoms given. Lungs hypostatically congested along post. borders. Pericardium contained *c.* ʒij. bloody serum. Heart normal. Venæ cavæ engorged. Stomach: mucosa besmeared with black substance (which I found to be solid opium), pale, except at one part (not specified) where it had a "dirty red" colour. *Reproductive System.*—No injury to pudenda, vagina, or cervix. Cervix dilated sufficiently to admit two fingers. Uterus, 7 ozs., flabby, empty; mucosa smooth, and of a greenish-blue colour, except over an area of ½ inch by 1½ on anterior wall at fundus, where it was granular and reddish (placental site).

(10.) *Arsenic Case.*—Stomach and contents, liver and kidney, all contained arsenic (separated by Reinsch's process).

P.-M.—No food in stomach, which contained a few seeds of cannabis indica and "dal" (pulse). Uterus enlarged, empty; 7½ inches long, 14¼ ozs. (therefore gestation reached fifth month); mucosa congested; "signs of recent abortion."

(11.) Case sent up for irritant poisoning in connexion with abortion. Stomach, vomit, and liver showed on analysis no signs

of any poison having been given. Patient (æt. 16) had suffered with rheumatism for nearly five years. *Symptoms:* She was given some curds which were alleged to have contained some drug capable of producing abortion. She suffered from great nausea and vomiting, thirst, faintness, headache, pains in limbs (? rheumatic), and became insensible. Abortion occurred.

P.-M. (time not stated).—Stomach's condition not mentioned. Intestines contained semi-fluid fæces. Uterus, 6½ inches long, 3¾ inches broad (therefore at fourth month); much blood-tinged fluid in its cavity; no fœtus present, but decomposed placenta and membranes attached to uterus. No signs of physical injury.

II. *By Local Means.*

(12.) In this case abortion did not result (six months' fœtus), though death did. The stomach and contents and liver were forwarded, but no poison was detected in any of them. Some "battis" forwarded were smeared with "Lal Chitra" paste. The woman, æt. 20, was found lying about a mile from her village with her hands and feet cut off, and with mud in her mouth. There was a quantity of jewellery on the body (death had occurred a few hours before it was found), so robbery formed no part of the motive for the assault which had been committed on her.

P.-M. (day after death).—Rigor present; brain not examined; heart filled with ante-mortem clots; no lineæ albicantes. On opening abdomen serum was found in the flanks, and the peritoneal coat of the womb was inflamed. Stomach had inflamed patches, congested puncta, and contained much tenacious mucus, as well as 2 ozs. of yellow fluid. Intestines normal. Liver enlarged; weighed 4 lbs. 2 ozs. Spleen enlarged; weighed 1 lb. 2 ozs. *Reproductive System:* Breasts full and prominent, nipples projecting, and areolæ dark coloured. Vagina dilated, with portion of anterior wall partially prolapsed; cervix dilated *and inflamed.* Membranes ruptured. "Battis" found in uterine cavity close to internal os, where uterus was inflamed. Peritoneal coat (as already noted) inflamed. Female fœtus *in utero,* about six months old. Placenta entire. Portions of membrane found, but no liquor amnii.

(13.) Crude carbonate of sodium was detected on a piece of cotton wool, which was found in a rent in the uterine wall (hence, in all probability, it was inserted at the end of a rigid body, twig, etc.). Death from peritonitis on account of the uterine rupture. Stomach contained some bismuth (given, no doubt, medicinally to arrest the vomiting from the peritonitis). "External and internal genitals red and irritated." Hæmorrhage from vagina, and collapse, are the only references to symptoms in the report. The case is remarkable as an alleged self-induced one by local means, most self-induced cases being by general means.

(14.) A piece of wood, 1 inch long and ⅛ inch thick, was the means by which abortion was procured in this case. She was also stated to have taken an abortive drug by the mouth, but there were no traces of it in the stomach and contents (which, as in the last case, contained bismuth) or in the liver. The body was buried, death having been stated to have resulted from "fever." Suspicions arose, and it was exhumed four days after burial. The case was that of a Mussulman, æt. 25.

P.-M.—Slight left pleural adhesions; stomach contained 6 ozs. of undigested food; no other appearances noted. Vaginal and rectal mucosa prolapsed (? by intra-abdominal gaseous pressure). Vagina congested. Uterus large, flabby, and endometrium highly vascular; weight, 12 ozs.; measured 6 inches at broadest part, and 7 inches long (five months pregnant). The piece of wood above described was found penetrating the uterus at its junction with the cervix.

(15.) Five battis, each 2 inches long, 1 line thick, and covered for two-thirds of their length with cotton wool, coated with a paste of pounded nutmeg; and a cloth stained with blood (mammalian, probably human, but on this point, of course, no opinion can be expressed positively in the present state of our knowledge). There are stated to have been no vaginal or uterine injuries. Cause of death was peritonitis following attempts to produce abortion.

(16.) The stomach, contents, liver, and one kidney were examined, with negative results, for abortives and poisons generally. The woman died after nine days' pyrexia, and the case aroused police suspicions, as she was known to be pregnant.

P.-M.—Mammæ enlarged, areolæ dark, fourchette lacerated, vagina dilated, cervix patulous and lacerated. Uterus, 1 lb.; 7 inches long, and 4 inches broad at fundus (therefore at the beginning of the fifth month); cavity empty, endometrium dark-coloured (? from congestion). Stomach is noted as containing about 1 oz. of semi-liquid contents and as being slightly congested.

(17.) The stomach, liver, one kidney, and uterus were examined for poisons with negative results. A pledget of cotton wool, stated to have been found in deceased's vagina, was found smeared with a paste of pounded croton seeds and aloes.[1]

P.-M.—Stomach empty; large gut contained scybala; pledget of wool in vagina; cervix patulous and lacerated. Uterus dilated, empty; endometrium dark-coloured; weight, 7 ozs.; 6 inches long, and 4 inches broad at fundus (four months pregnant). In this case the death was reported to the police as from abortion by a relative.

(18.) Here the stomach contents, liver, and uterus were examined for poisons without result. On a pledget of cotton-wool,[1]

[1] In both these cases it is very probable that the pledgets had been placed *in situ* by fingers, and not on any stem or improvised probe.

alleged to have been found in deceased's vagina, very fine particles of white arsenic were detected, and on sublimation the typical arsenious acid crystals were obtained. *Symptoms:* She was last seen to drink a preparation of kharbuza seeds. Three hours after, abortion symptoms came on. She fell asleep, and this deepened into insensibility, and death followed.

P.-M.—Stomach contained a small amount of bilious fluid. Small intestine inflamed in patches; creamy contents. Heart empty, and contracted, with ʒij. bloody serum in pericardial sac. *Reproductive System.*—Vagina contained blood-clots and the wool pledget. Uterus, 5 inches long, 3½ inches broad (well on in the third month of pregnancy), empty and anæmic. Cervix dilated to 1½ inch diameter, with margins thin and sharp. Ovaries decomposed.

(19.) In this case the viscera contained no poison that I could discover, but two pledgets of cotton wool found in the deceased's vagina showed, by Reinsch's process, arsenic.[1] No post-mortem or other details.

(20.) No poison detected in the stomach and contents or liver.

P.-M.—Vulva swollen. Whole genital tract congested. Uterus at fifth month; cavity, 6 inches by 4 inches; portions of decidua present.

(21.) In the stomach, liver, and uterus no poisons were found. On a cotton wool pledget, found in the cervix,[1] saffron was alone detected. Relatives stated that deceased had suffered from fever (?) for twenty days.

P.-M.—Uterus, 3½ inches long, 2½ inches broad; 2½ ozs. in weight (three months pregnant); cavity empty. "Signs of recent abortion."

(22.) Here death was certified as due to peritonitis and septicæmia, the result of abortion. In the viscera sent me (viz., stomach, piece of small gut, and liver) no poison could be detected. The cause of death was not far to seek,—a piece of stick having perforated the uterus.

P.-M.—(Age 18). Stomach mucosa congested at cardiac end, probably in connexion with the peritonitis; empty. Small intestines mucosa bore some congested patches. Kidneys congested. Bloody fluid in pelvis. Uterus enlarged; weighed 8½ ozs. The right cornu, which was blackened, was perforated by a piece of stick (not forwarded for examination) measuring 5 inches long.

This concludes the cases where clearly local means were employed.

(23.) In this case a mixture of pounded nutmeg and "gur" (molasses) was found in the pocket of a woman who had died from the effects of abortion, whether induced by local or general means

[1] In both these cases it is very probable that the pledgets had been placed *in situ* by fingers, and not by any stem or improvised probe.

it is impossible to say from the bald account sent in connexion with the case.

(24.) Here Crotalaria juncea was the alleged abortifacient. This substance was not detected in the stomach (the liver also was sent; there are no means that I know of separating any ingredient of this substance from the viscus). No account of the symptoms or post-mortem appearances was forwarded, nor was the uterus sent.

(25.) Two powders (whose contents were found on analysis to be common alum) were sent for examination in connexion with an alleged case of abortion.

(26.) Six pills (found to contain, as their active ingredient, arsenious acid) were forwarded to me for analysis in another alleged case of abortion.

Prof. Simpson said the Society was indebted to Surgeon-Captain Bedford for the interesting communication which the Secretary had read. Criminal abortion was so rarely a subject of observation with us that such an extended series of cases became valuable. When we were told of the rude methods employed for procuring the abortion, we were the less surprised to find so many ending fatally and coming under the notice of the police authorities. It did not appear that among the drugs employed there were any that seemed to have special power of stimulating uterine activity. So far as could be gathered from hearing the paper read, their action seemed to depend on the local irritation they produced.

VII. TERATOGENESIS: AN INQUIRY INTO THE CAUSES OF MONSTROSITIES.

By J. W. Ballantyne, M.D., F.R.C.P.E., F.R.S.E.

I.—CAUSES OF MONSTROSITIES—(*Continued*).

A. Theories of the Past—(*Continued*).

2. *Physical Causes.*

It must not be supposed that the only teratogenic theories in vogue in past times were those which recognised supernatural agencies. As a matter of fact the early Greek philosophers looked for purely *physical* causes of monstrosities, and these they found in disturbances of the natural phenomena of reproduction. At the same time it must be borne in mind that the notions regarding generation which prevailed in the early Greek age, although vastly more correct than many of the fancies of the Middle Ages, were yet in certain points defective and even erroneous. Consequently the teratogenic theories founded upon them were not

free from mistakes. Such as they were, however, they held their ground for something like two thousand years, and even now their influence is to be felt in many of the doctrines of the day.

In order to understand these theories it is necessary to remember the views concerning reproduction which were held by the early Greek writers; these may be indicated in a few words. Since the invention of the microscope was still in the distant future, nothing was known of the existence of human ova and spermatozoa. The evident facts of the generative process were the seminal discharge in the male and the menses in the female. Some writers regarded the semen as the sole, or at least the principal, factor in reproduction; according to them the woman was nothing save a temporary abode for the fœtus. Others were of opinion that the menses supplied the material for generation, and that the male semen was of comparatively little importance. Others, again, saw that both semen and menses were essential factors; and in words which have been ascribed to Aristotle, "The blood of the menses is the marble, the semen is the sculptor, and the fœtus is the statue." Somewhat similar views prevailed amongst the Romans. Pliny, for instance, in speaking of the menses says—I use the words of Holland's translation:—"In very deed it" (*i.e.*, the menses) "is the materiall substance of generation: and the man's seed serveth instead of a runnet to gather it round into a curd; which afterwards in processe of time quickeneth and groweth to the forme of a bodie."

The menstrual blood seems sometimes to have been called the female semen, and the sex of the fœtus was supposed to be due to the greater strength of one of the two seeds. Another notion was that boys were generated in the right testicle and girls in the left; and yet another was that when the semen was deposited in the left side of the uterus a female embryo resulted, when in the right side a male.

Mention, also, must here be made of another belief concerning generation which had its origin far back in the history of the world, and in illustration of which many examples may be found in Greek and Roman mythology. I refer to the supposed fertility of animals of different kinds with one another, and even with man. Aristotle, even, believed in this view to a certain but small extent, and later authors accepted the theory in its widest sense, and with its most ludicrous developments.

The theories of the Greeks passed in process of time to the Romans. During the Dark Ages in Europe they were cherished by the physicians of Arabia, and so in process of time they came to be the views of the nations of Western Europe, when the revival of learning put an end to the epoch of intellectual barrenness. In many ways, however, the original lucidity of the classic theories was obscured during the long period which elapsed between the times of Hippocrates and Aristotle, and those of Paré and Licetus;

and metaphysical notions abounded in the writings of the Middle Ages, greatly to the detriment of the purely physical notions of the Greeks.

The teratogenic theories of the past which looked for physical causes of monstrosities were based upon the study of the phenomena of generation as these were then understood; they were, in fact, deductions from them. Further, the various phases of the ideas concerning reproduction were all reproduced in the theories of the causes of teratological productions. Those writers, for instance, who regarded the male semen as the sole, or at any rate as the chief factor in generation, ascribed teratogenic properties to alterations in its quantity or quality. Others, considering the menstrual discharge as of prime importance in reproduction, looked to it as the cause of monstrous births. These two primary theories did not, however, long exist separate, for it soon came to be recognised that both parents might supply teratogenic factors; thus a sort of coalition hypothesis in which now the seminal and again the menstrual element would predominate came into being and long persisted,—persists in a certain sense still.

Alongside of these theories was constantly to be found that other which regarded teratological productions as the result of intercourse between animals of different kinds and between man and the brutes. This, also, as will be at once seen, was the direct outcome of the old notion of fertility between different genera.

It will be convenient to consider these matters under four headings:—(1), Alterations in the male semen; (2), menstrual influences; (3), alterations in both the male and female elements; and (4), hybridity.

(1.) The theory that monstrous infants are the result of *unusual conditions of the paternal element in generation—the male semen*—is a very old one; it seems first to have been expressed by Empedocles of Agrigentum, in Sicily, a physicist living between the years 495 and 435 B.C. He has been called the "father of the evolution idea,"[1] and seems to have had some knowledge of embryology and teratology. Empedocles, like Lucretius some four centuries later, recognised what may be called a teratological stage in the world's history when animals appeared, spontaneously generated, as incomplete individuals—"heads without necks, arms without shoulders, eyes without their sockets"—and when through the fortuitous union of these parts with one another all sorts of monstrous forms came into being, soon, however, to become extinct through the absence of reproductive powers. But it is rather with the views that this philosopher advanced to explain the origin of monstrosities after Nature had succeeded in producing normal permanent animal types that we have here to

[1] Osborn (H. F.), *From the Greeks to Darwin*, p. 37, New York and London, 1894.

do. As Plutarch[1] relates, Empedocles thought that monsters happened either from abundance or from defect of the semen, from slowness of movement, from division of it into several parts, or from aberration of the movement. Although five states are here enumerated, only three ideas really exist, these being the notions of excess, of defect, and of alteration of the semen. Curiously enough, these are precisely the ideas which underlie recent views, not, indeed, of the causation of teratological products, but of their classification. For the primary division of monstrosities into *monstra per excessum*, *monstra per defectum*, and *monstra per fabricam alienam*, which Förster employed, or into *monstra deficientia*, *monstra abundantia*, and *monstra sensu strictiore deformia*, as Otto recommended, cannot yet be said to have been improved upon. So in a certain sense it may be said that the views advanced so long ago by the Sicilian physicist live still; and there can be no doubt that they were widely accepted by Greek, Roman, and mediæval authors.

The teratogenic theories of Democritus of Abdera, another physicist of the same age as Empedocles, did not take a very firm hold upon the philosophic mind. As we are told by Albertus Magnus,[2] Democritus thought that double monsters were generated when the semen belonging to one or to two species was introduced into the uterus repeatedly at intervals; to begin with, the first semen reached the womb and sufficed to form the new being; soon thereafter the second semen arrived, mixed with the first, and began to operate in its turn; and so the members came to be duplicated. The abuse of coitus was thus made out to be a teratogenic factor.

Neither Empedocles nor Democritus ascribed to the female any formative power in the matter of generation; Aristotle, on the other hand, did so, and in consequence of this his theory of teratogenesis included faults in the female element in reproduction as well as in the semen. The Aristotelian hypothesis, therefore, was one which recognised a dual cause, and as such it will fall to be discussed immediately; in the meantime it may be said that through its weighty authority the case of the theories which looked for solely a seminal or solely a menstrual teratogenic factor was greatly weakened. Nevertheless Galen, living in the second century of the Christian era, seems to have believed in a purely seminal theory, for he thought that hermaphrodites were due to the entrance into the uterus of spermatic fluid from both the testicles.

The Arabian physicians during the Dark Ages in Europe served to perpetuate the doctrines of the past, and prominently those of Aristotle; but Avicenna, like Galen, sought for an explanation of the origin of hermaphrodites along the lines of the older theories, for he believed that whilst semen deposited in the left side of the

[1] Plutarch, *De placit. philos.*, lib. v., c. 8.
[2] Albertus Magnus, *De animalibus*, lib. xviii., c. 6.

uterus resulted in the birth of a girl, and in the right side in that of a boy, the male element when placed in the middle of the cavity gave rise to the procreation of a hermaphrodite.

In Europe in the thirteenth and fourteenth centuries certain contributions were made to the study of the causes of monstrosities; but the question was greatly complicated by the introduction of the terms "materia" or "material" instead of semen, and by the supposition that this materia had a formative virtue or faculty. In this way confusion was the result, for "materia" came to be applied to the menses as well as the semen, and the "formative faculty" was an idea which encouraged all sorts of profitless theorisings. To some of these hypotheses allusion will be made immediately when the causation of monstrosities through faults in both male and female elements in generation is under consideration. Here it may simply be said that the theory of Empedocles never again came to be accepted fully, although the discovery by Leeuwenhœk (in 1677) of spermatic animalcules in the semen gave a temporary support to the notion that after all the male element might be the chief, if not the sole teratogenic factor. With the discussion of the influence of the spermatozoa in producing monstrosities we have not at present to do; that is a matter to be considered along with the theories of the present, not with those of the past.

(2.) The idea that *the menses* play an important part in the generation of monsters seems largely to have been the result of the Hebrew legislation regarding coitus during or immediately after the flow. In a non-canonical book (Esdras, Book iv., c. 5, verse 8), the following statement occurs:—"Menstruous women shall bring forth monsters" (*mulieres menstruatæ parient monstra*); and in the Talmud the infant conceived during the period of impurity was regarded as certain to be an epileptic, a cretin, a drunkard, or insane. At the same time indications of a similar belief are to be found in the records of classic mythology, for it is said of Vulcan, who was so deformed at his birth that his mother in disgust threw him into the sea, that he was begotten by Jupiter when Juno was menstruating.[1] Witkowski (*Histoire des Accouchements*, p. 335, Paris, 1887), refers also to this belief, which he regards as a very common one, and quotes the following lines in which it is embodied in verse:—

> "Femmes qui désirez de la progéniture,
> Durant le cours des mois respectez la nature;
> Le fils de Jupiter, Vulcain, ainsi concu,
> Vint au monde impotent, cul-de-jatte et bossu."

Aristotle and his followers did not admit the pre-eminence of the menses in teratogenesis; the menstrual blood or materia was only

[1] Another explanation of Vulcan's deformity was, of course, the notion that Jupiter was drunk at the time of his conception.

one factor in normal generation, and therefore also in abnormal generation. Nevertheless there were some who regarded the menstrual blood as of greater importance than the semen in the causation of monstrosities; thus Henricus of Saxony,[1] a pupil of Albertus Magnus, regarded teratological phenomena as due to deficiency or excess of the materia or menses. Paré,[2] also, amongst the numerous causes of monsters places intercourse between parents at such times as they ought to forbear by the command of God and the Church. Licetus, writing in 1616, mentions the menstrual flow at the time of conception as the seventh cause of the origin of shapeless monstrosities, and founds his belief on the passage in Esdras already referred to, and on a quotation from Solinus.

When it is borne in mind that Pliny and many of the writers of the Middle Ages attributed to menstrual blood the most maleficent powers as regards vegetables, metals, glass, trees, and even animals, it is not to be wondered at that numbers of authors found in it at least one of the causes of deformed births. Towards the close of the seventeenth century, however, discoveries were made which revealed the hollowness of such beliefs; and it was from the investigations of Harvey and de Graaf, and from the light which they threw upon the true nature of the female factor in reproduction, that the menstrual theory of teratogenesis received its death-blow. We know now that anomalies in the female factor are frequently causes of monstrosities, but that factor is no longer the menstrual blood but the ovum.

(3.) The theory which regarded *alterations in both the male and female elements in generation* as the cause of monstrous forms may rightly be called the Aristotelian. Aristotle[3] (384 to 322 B.C.), by means of his great intellect and strictly scientific methods of research by experiment and induction, placed all the workers who followed him in the position of debtors. Even in the subject of teratology his views were far in advance of his time. The definition which he gives of monstrosities reveals an extraordinary degree of critical insight. It may be thus rendered:—"The monstrosity," he said, "is something contrary to Nature; or rather, not absolutely contrary to Nature, but contrary to that which occurs most commonly in Nature; nothing is produced contrary to Nature, inasmuch as it is eternal and necessary; this occurs only in the things which are most usually produced in a certain manner but which may be produced otherwise." Aristotle, also, refuted the opinion of Democritus concerning the origin of monstrosities; neither did he adhere to the theory of Empedocles, for he believed in the conjoint action of perverted states of both sperm and germ. He recognised the teratogenic

[1] Henricus of Saxony, *De Secretis mulierum*, c. 6, 1478.
[2] Paré (A.), *Works*, translated by Th. Johnson, p. 585, London, 1678.
[3] Aristotle, *De generatione animalium*, lib. iv., c. 3 and 4.

power of faults in the materia which exists in the menstrual blood, and pointed out the more frequent occurrence of terata in the animals that produce many young ones. He was truly the founder of both human and comparative teratology, and as regards the latter subject his knowledge of the embryonic origin of double monsters in the hen's egg was really wonderful. Had he known that man also originates in an ovum, it is more than probable that he would have applied the facts of teratogenesis in the chick to human teratology, and so have discovered in the fourth century B.C. what has been reserved for the savants of the nineteenth century A.D.

The doctrines of Aristotle were handed down by succeeding writers, Roman and Arabian, to the times of the Middle Ages in Europe, when Albertus Magnus, a Dominican monk (1193 to 1280 A.D.), accepted, but with modifications, the views of the Greeks concerning the production of monstrosities. The modifications were most unfortunate, and were destined greatly to obscure the original theories. Thus, Albertus admitted the teratogenic powers of the semen, but he used the word *materia* as a synonym; those who followed him lost sight of the real meaning of the term, and so great confusion was introduced. Again, Albertus ascribed to the stars the same powers in the production of monstrosities as he gave to the materia, and so gave his sanction to the supernatural notions of his time. He also believed with Aristotle that terata were less frequent in uniparous than in pluriparous animals. His disciple, Henricus of Saxony, held views to which reference has been already made. He seems to have regarded the materia as the menses, and he thought that all the causes of monstrosities might be reduced to two: disobedience of the materia, and its insufficience. He introduced, also, such secondary causes as faults in the uterus preventing the retention of the semen, and the position of the body during coitus.

Thomas Aquinas, another Dominican of about the same period (1225 to 1274 A.D.), introduced the idea of a formative power or faculty which acted upon the semen; and, like Albertus Magnus, he ascribed teratogenic properties to the heavenly bodies. With him indisposition of the materia was the immediate, and the effect of the stars the remote factor in teratology. Pietro di Argelata added the notion of a formative power or faculty to the doctrine of the Greeks, for in writing concerning supernumerary and large and small digits, he admitted that they were caused by excess or defect of the materia, but only if these were combined with a strong or a weak formative power. The last-named factor was the more important; indeed, with only a small amount of materia, a large part might be produced if the formative faculty were sufficiently great. Possibly in such a case the formative power made the materia more obedient to movement and more capable of extension.

In the early years of the sixteenth century ample evidence was forthcoming in the writings of the time to show how confused the original Greek theories had become. Bonacioli,[1] an author of this age, seems to have returned to the views of Empedocles with regard to the formation of fœtuses with supernumerary parts, hermaphrodites, and monstrosities showing defects; he also complicated matters by referring to a materia supplied by the woman as well as by the man. About the middle of this century Savonarola[2] wrote at some length on the generation of moles from the semen and menses, reproducing largely the opinions of Avicenna; he stated that some women, from impurity of the blood, gave birth not only to a true fœtus, but also to a piece of flesh resembling an animal, *e.g.*, a toad, falcon, lizard, etc.; this was due to an error in the second semen, and this error was the result of stellar influence. Varchi,[3] whilst he believed that the two principal causes of monstrosities were faults (qualitative and quantitative) in the male semen and in the menses of the woman, also recognised others, such as the state of the uterus and the secundines, the imagination, and the effect of the heavenly bodies. The last-named cause was introduced so as not to contradict the theologians.

Towards the close of the sixteenth and beginning of the seventeenth century the tendency, already seen in Varchi's writings, towards a multiplication of the causes of monstrosities became very evident. Paré, for instance, enumerated eleven different teratogenic factors, and Licetus gave even a larger number for selection; but both these writers gave a very prominent place to faults in the material; thus the third and fourth causes of Paré were, "abundance of seed and overflowing matter, and the same in too little quantity and deficient;" whilst Licetus referred to such conditions as "defect of proper material," "inaptitude of the material," "feebleness of the formative or separative faculty," and the like.

It is unnecessary to quote further from the writers of this century (the seventeenth), for in all of them the same ideas are reproduced,—often, however, with a great deal of obscurity, and not uncommonly in language which has to us now little or no meaning at all. The embryological discoveries of the later part of the century so altered the notions of generation which had prevailed that the old teratogenic theories founded upon them fell to the ground. As we shall see later, their place was taken by new hypotheses, which in not a few instances embodied the notions of the ancients; and it came to pass that instead of talking of excess or defect or alteration of the semen, the menses, and the materia,

[1] Bonacioli (L.), *Enneas muliebris*, c. ix., Ferrara, about beginning of 16th century.
[2] Savonarola (M.), *Practica major*, tr. vi., c. xxi., f. 269, Vinetüs, 1559.
[3] Varchi (B.), *Lezioni sopra la generazione dei mostri*, p. 101, Firenze, 1560.

teratologists began to theorise regarding faults in the spermatozoa in the ovum, or in the product of their union, the embryo.

(4.) The theory which has now to be considered might quite well have been discussed with the preceding, for it has to do with conditions affecting the male and female elements in generation; but it has at the same time very characteristic features of its own, which serve specially to differentiate it. It may be termed the *hybridity theory* of teratogenesis, and it is founded upon the notion that animals of different kinds may be fertile with one another; the products of such unions are, however, monstrous. It was only an expansion of this doctrine to believe that deformed infants resulted from the cohabitation of the human subject (male or female) with one of the lower animals.

"That which followeth is a horrid thing to be spoken; but the chaste mind of the Reader will give me pardon, and conceive that, which not onely the Stoicks, but all Philosophers, who are busied about the search of the causes of things must hold, That there is nothing obscene or filthy to be spoken." Thus wrote Paré[1] some three hundred years ago in his chapter entitled, "Of monsters by the confusion of Seed of divers kinds;" and, notwithstanding the boldness of a modern novelist, who has described, in *The Island of Dr Moreau*, a community of creatures half human and half animal, the theory under consideration is one over which it is not profitable long to linger.

The finding of an anencephalic human fœtus[2] preserved as a mummy in a sarcophagus reserved for sacred animals at Hermopolis, on the Nile, proves that in ancient Egypt the bestial origin of monstrosities was a common belief. The anencephalic fœtus had evidently been regarded as a monkey, an animal sacred in the eyes of the Egyptians, and having been the offspring of a woman, its conception had, doubtless, been ascribed to an act of unnatural intercourse. There is even evidence to show that in these times such acts were, under certain circumstances, looked upon as praiseworthy. Possibly the same views held also in ancient Chaldea; at any rate, the cuneiform tablets of Nineveh speak of a ewe giving birth to a lion, etc.[3] It is easy to understand how such beliefs arose when it is remembered that at the time all kinds of animals, including man, were supposed to be fertile with one another, and that the male was regarded as the sole factor in generation.

In the mythology of nearly all the races of mankind traces are to be found of similar notions. In the legends of the Greeks and Romans, for instance, mention is often made of the Minotaur,

[1] The Works of Ambrose Parey. Transl. by Th. Johnson, p. 599, London, 1678.

[2] Geoffroy Saint-Hilaire, "Description d'un monstre humain né avant l'ère Chrétienne, etc.," *Ann. des sc. nat.*, vii. p. 357, 1826.

[3] Ballantyne (J. W.), "Teratological Records of Chaldea," *Teratologia*, i. p. 139, 1894.

"semibovemque virum, semivirumque bovem;" of Echidna and Chimæra, offspring of Medusa; of Chiron the Centaur, half a man and half a horse; of Castor and Pollux; and of many others. But the conception of half human monstrosities was not an attribute of the gods of Olympus only; it was a faculty shared in by the humblest of mortals, as is witnessed by the tale which Plutarch[1] tells of Periander's shepherd and the centaur-like offspring of a mare. This same writer attributed to Aristotle the story of the beautiful daughter of Aristonymus of Ephesus, whose name was Onoscellis, which name suggests clearly her asinine origin.

This reference leads us naturally to the consideration of Aristotle's views upon the subject of hybridism. He[2] held that animals were only fertile with each other when the duration of their gestation-period was the same and when their size was similar. The offspring would resemble either of the parents. The case of the fox and the dog was cited, and Aristotle elsewhere[3] spoke of the products of the intercourse of heterogeneous animals in Libya, Cyrene, and Laconia. In this relation, as in so many others, Aristotle's more correct views were soon lost; and Pliny,[4] for instance, speaks of a bondwoman who brought forth a serpent, and of Alcippe, who was delivered of an elephant, "marie that was a monstrous and prodigious token, and foreshewed some heavie fortune that followed after." Pliny also states that "Duris maketh report, That certaine Indians engender with beasts, of which generation are bred certaine monstrous mungrels, halfe beasts and halfe men."

It is easy to imagine how such beliefs as those mentioned above grew and flourished in the period of intellectual darkness in Europe. Many traces of this are to be found in the writings of Vincent de Beauvais, of Bartholin, of Lycosthenes, of Rueff, and others. C. Stalpart vander Wiel, for instance, in his *Hondert seldzame Aanmerkingen*, pp. 234 and 248, Amsterdam, 1682, not only relates how a woman gave birth to a little dog ("Houdeken van een Vrouw geboren"), but even figures the prodigy, which seems really to have been a human otocephalic fœtus without a lower jaw. During this epoch it would seem that if a woman gave birth to a fœtus in any way resembling an animal she ran a very considerable risk of being burnt alive with her offspring, and with the animal who was supposed to have been her partner in the illicit commerce. Such a fate, Bartholin[5] tells us, befel a woman in Copenhagen, in

[1] Berger de Xivrey (J.), *Traditions tératologiques*, p. 34, Paris, 1836.
[2] Aristotle, *De generatione animalium*, lib. iv.
[3] Aristotle, *De animalibus historiæ*, lib. viii., c. 27, p. 227. (Bohn's translation.)
[4] Pliny, *Natural History* (Holland's translation), i. p. 157, London, 1601.
[5] E. Martin, in his *Histoire des Monstres* (p. 80), refers to this statement by Bartholin, but he gives no reference; and although I have searched Bartholin's writings, I have found no trace.

the year 1683, as the result of the birth of an anencephalic fœtus. Suspicion also fell upon the animal who brought forth a fœtus in any way resembling the human type, *e.g.*, a hydrocephalic foal or calf; and I have already referred to the service which Albertus Magnus rendered to a shepherd when he announced that such a birth might be due to stellar influence, and not to the more popularly credited and criminal procedure.

With the revival of learning came attempts, not very active at first, to controvert the doctrine of the bestial origin of monstrosities, and the ancient views of Aristotle came again to the front, that animals could only be fertile with those of the same size whose period of utero-gestation was approximately of equal length. Martin del Rio,[1] a writer of the early part of the seventeenth century, while declaring that physically a cow could not give birth to a human fœtus, was yet of opinion that something of this kind could happen through a diabolic agency. Licetus,[2] however, in five chapters in the second book of his work, *De monstris*, opposed the doctrines of Del Rio, and endeavoured by copious references to cases, and by analogy with the vegetable kingdom, to prove that such unnatural unions may not only result in the birth of a human fœtus or an animal, but also in the production of monstrous forms partaking of the characters of both. Neither the legal nor the theological side of this matter were neglected by the writers of this century, and the question whether such offspring ought to be baptised caused much discussion.

Even near the close of the seventeenth century evidence is not wanting to show how persistent was the belief in this mode of origin of monstrosities; for instance, Paullinus,[3] in 1688, gravely writes of a "Monstrum canino-humanum cum flamma et fragore natum"; and Bartholin tells of a "puella ex cane nata" (*Hist. anat., Cent. V.*, p. 166, 1661). It is true that Ambrosinus,[4] in his edition of Aldrovandus' *Historia Monstrorum*, had brought in other factors, such as the influence of the maternal imagination, to explain such births; but his suggestions do not seem to have been taken up very widely.

It is not till the beginning of the eighteenth century that we find a strong protest being made against the belief in the hybridity theory of teratogenesis. Bianchi[5] of Turin was amongst the first to point out that when the product of human gestation had a rough resemblance to an animal form this resemblance might be due to

[1] Del Rio (M.), *Disquisitionum magicarum*, lib. ii., quaest. 14, p. 331; Lovani, 1598–1600.

[2] Licetus (F.), *De monstris*, lib. ii., c. 68, 69, 70, 71, and 72, pp. 213 to 231; Patavii, 1668.

[3] Paullinus (C. F.), *Miscell. curios. med. phys.*, Dec. ii. Ann. vi.; Appendix, obs. xli. p. 48; Norimbergæ, 1688.

[4] Aldrovandus (U.), *Historia Monstrorum*, p. 385; Bononiæ, 1642.

[5] Bianchi (G. B.), "De naturali in humano corpore vitiosa," etc., pt. ii. p. 238, 1741.

a fœtal disease, or the product itself might be a mole or retained portion of the placenta. Even at the present day, however, there still exists a strong popular belief in the old theory, and even in the ranks of the profession I have met with its adherents.

Now, there can be no doubt that the cases which gave rise to this belief and kept it in existence were those in which disease or deformity gave to the human fœtus an animal appearance, or in which the young of one of the lower animals, through the existence of such a condition as hydrocephalus, came to bear a rough resemblance to the human form. At the same time, the theory has a modern and scientific side, of which a great deal may yet be heard. To quote from such a skilled teratologist as Mathias Duval,[1] writing as recently as 1895, hybridity is a phenomenon of which little is known in the higher forms of animal life, but some day its discussion may form an important chapter in teratology; for it is quite possible that sterility between animals of different species may be due, not to an absence of impregnation, but to such an abnormal development subsequent to impregnation as to cause arrest by its very abnormality. This belief gains some support from the experiments of Pfluger and Smith,[2] Born,[3] and Gebhardt,[4] on the production of bastards among the amphibia.

Such, then, were the theories of the past, which regarded purely physical conditions as the causes of monstrosities; and with regard to them all it must be noted that the ideas underlying them exist still, but in an altered form, and expressed in different words. It will have been noticed also that there exists a much closer connexion between these theories of the past in their earliest form and the views of the present, than between the latter and the notions of the Middle Ages. The theories of Empedocles and Aristotle are, in other words, more nearly allied to those now in vogue than are the latter to those of Lycosthenes, Licetus, and Aldrovandus. I have regarded the discovery by means of the microscope of the human ova and spermatozoa as the boundary line between what are called theories of the past and those which I shall have soon to describe and designate theories of the present; but there can be no hard and fast dividing line in this matter, and it becomes an interesting subject for speculation to consider in what way the knowledge obtained from the use of the microscope might have influenced the teratogenic views of the early Greek philosophers.

I have now passed in review both the supernatural and the physical teratogenic theories of the past, and before proceeding to

[1] Duval (M.), in Bouchard's *Traité de Pathologie générale*, i. p. 159, 1895.

[2] Pfluger and Smith, "Untersuchungen über Bastardirung," *Arch. f. ges. Physiol.*, xxxii. p. 519, 1883.

[3] Born, "Weitere Beiträge zur Bastardirung zwischen einheimischen Anurarten," *Arch. f. mikr. Anat.*, xxvii. p. 192, 1886.

[4] Gebhardt (W.), *Ueber die Bastardirung von Rana esculenta mit arvalis* Dissertation, Breslau, 1894.

the discussion of another old yet ever new theory,—that, namely, of the effect of the imagination of the parents upon the infant *in utero*, —it must be pointed out that these hypotheses have not followed one another in chronological order, but have existed, more or less, side by side, and have even overlapped. For example, a belief in the teratogenic powers of the stars has been seen combating the notion of the hybrid origin of malformed infants, and this in its turn has been confronted with the view that the powers of evil are the potent factors in teratogenesis. At the same time, it is easy to understand how in certain epochs of the world's history certain opinions have been more widely held and more strongly insisted upon than in others.

Prof. Simpson thought the Society was greatly indebted to Dr Ballantyne for communicating to them his teratogenetic observations. The paper to which they had listened did not lend itself to discussion, but would be found of much value to all who were engaged in making researches in this rather neglected department of pathology.

MEETING VIII.—JUNE 10, 1896.

DR J. HALLIDAY CROOM, *Vice-President, in the Chair.*

I. *Dr J. W. Ballantyne* exhibited a FŒTUS PAPYRACEUS or COMPRESSUS which Dr John Stevens had kindly given him for examination. It was accompanied by the after-birth, which consisted of two placental masses, with the smaller of which the fœtus papyraceus was connected. The mother was a vi.-para of about 35 years of age, and had had uneventful pregnancies up to the present one. In it she gave birth between the seventh and eighth months to a male fœtus which had evidently been dead for two or three weeks, and along with its placenta there came away the second smaller placenta and the fœtus compressus. It may be judged that the latter fœtus died about the third month of intra-uterine life, and the former about the seventh. There was no history of traumatism or syphilis. The larger placental mass measured 11 cms. by 10 cms., and the smaller 7 cms. by 8 cms., and the two were united by a narrow neck of placental tissue. The flattened fœtus lay in its own amniotic sac, and was attached to the smaller placental mass by a thin umbilical cord; it formed a flat cake of a somewhat ovoid shape, measuring 7·5 cms. in length by 5 cms. in breadth, and about ½ cm. in thickness.

II. THE INDIGESTION OF BREAST BABIES.

By JAMES CARMICHAEL, M.D., F.R.C.P., Physician to the Royal Edinburgh Hospital for Sick Children; University Lecturer on Disease in Children.

FOR many reasons less attention has been paid to the gastro-intestinal affections met with in breast babies than in those nursed artificially. Breast milk is the natural, and ought to be the sole food of the infant, under physiological conditions, during the first year of life. Unfortunately there is too often a departure from the normal state, and the child, and perhaps also the mother, may suffer during the lactating period. The natural pride and instinct of the mother is apt to lead to the presumption that all is going well with her and the infant, when, perhaps, in reality she is not a good nurse, and the child is suffering more or less, and not thriving. How often do we get an affirmative answer from the mother when we put the general question, "Have you plenty of milk?" It is the duty of the practitioner to take this reply only for what it is worth, and that is often very little. He must judge for himself, unprejudiced by any notion of the mother. The breasts should be carefully examined, and also the milk. The health of the mother and of the child as to its nutrition growth and development should be inquired into, in order to arrive at a correct opinion. Looking into the literature of the important subject to which I am to direct your attention for a short time, we find that until quite a recent date comparatively little has been written in a systematic and detailed manner on the simplest forms of indigestion met with in breast babies. On the other hand, the more serious and frequent form of gastric intestinal catarrh met with in substitute feeding is a subject which has been largely treated of by pediatricians.

In America the question of infant feeding in all its aspects has received the well-merited attention which it deserves, and which it has not met with in this country. The greater prevalence of diarrhœal disease during the tropical summer of the American continent has stimulated study and research on this important subject. Milk laboratories have been established in the larger cities, and the feeding of infants has been placed on a comparatively sure and scientific footing. Owing to the researches of such men as Jacobi, Morgan Rotch, Emmet Holt, Lewis Smith, Meigs, and others, we are now furnished with scientific data to guide us in the study of the subject. In this country the question of our milk supply is now receiving some attention from sanitarians, but we have as yet no ready means available to the general public of obtaining pure or properly sterilised milk on a large scale, nor of having milk analysed or tested in laboratories established for the purpose. I think the question of the establishment of such a laboratory in the city of Edinburgh is one well worthy of the

attention of our sanitary authorities. We would then have a ready means of getting milk analysed at a small cost, and also be able to obtain "supplies" of standard milk and cream separated by the centrifugal process, which is the only one whereby it can be obtained in a fresh state. The cream used at present, as prepared in our dairies, after having been exposed to the air for from twelve to twenty-four hours in open flat dishes, is a dangerous commodity for feeding young infants, and even for family use. It is necessarily impregnated with micro-organisms, and therefore poisonous. Our sanitary authorities, in giving attention to milk, ought to supervise the cream supply as well.

In inquiring into the causes of indigestion in breast babies, we assume that, in a healthy child nursed by a healthy mother, it rarely, if ever, occurs. The conditions which lead to a departure from normal conditions, and which injuriously affect the child, are numerous. A certain group of causes which may affect both mother and child simultaneously I shall merely mention, without further comment. I refer to defective hygienic conditions generally, such as unhealthy, low-lying, and damp dwelling-houses, noxious effluvia from drains, or malarial poison. Under such circumstances both mother and child are apt to suffer, unless removed from the injurious influences. As it is to the mother specially that we have to look when the child suffers, we find that any departure from normal health is apt to affect her milk supply.

General debility is perhaps one of the most frequent causes of inability to suckle. A large proportion of mothers in the present day are unable to nurse, or only to do so partially, from causes not always well ascertained in any given case. Multiparæ who were able to nurse the first baby are often less able to do so on subsequent occasions. Too frequent pregnancies are sometimes a fruitful cause of inability to nurse. The system becomes soon exhausted and the nerve-tone lowered, the appetite defective, and lactation fails. Many other causes are at work, and many of these lie deeply at the root of our social system. I cannot help thinking that in some respects the upbringing of girls in the present day is unfavourable to a healthy maternity. At most schools they are educated on the same lines as boys. The nerve-energy which should be conserved during the developmental period is exhausted by study, and when the time arrives at which the young woman is called upon to discharge her maternal functions, we meet with, during labour, uterine inertia and exhaustion, and subsequently defective milk supply. I think it is a duty incumbent on medical men to discountenance the present system of over-educating girls, which, although it may make clever women, unfits them for properly discharging their maternal duties, and therefore produces anything but healthy mothers. Poor women who are badly fed and overworked are often inefficient

nurses. From a different class of causes women of the upper classes of society who lead a fashionable life, with all its dissipations and excesses, take little exercise, and live too high as regards feeding, never make good nurses. Mothers suffering from any disease of a chronic nature, whether organic or functional, may be unfit to nurse their babies. Thus gouty women who suffer from any of the irregular forms of this disease, such as gastric or hepatic derangement, are unable for lactation. Over-anxiety and mental worry are fruitful causes producing the same results. Phthisis or syphilis—certainly the former—is a contra-indication to lactation, and so we might enumerate many other morbid states which are likely to interfere with normal lactation. Suffice to say that ill-health in the mother, from whatever cause, whether functional or organic, is apt to prove a hindrance to suckling. Before leaving this part of the subject we must refer to the condition of galactorrhœa, the causation of which is not well ascertained, but must in some way or another be closely connected with the nervous system. From whatever cause, in this affection there is an over-excitability of the secreting functions of the milk glands, leading to a constant flow of watery milk, which is unsuitable and insufficient as a nutriment for the infant. Other causes of a local nature may be met with in the breast itself; thus mammary abscess often, but not always, interferes with the continuance of lactation. Malformed nipples are also a serious bar to nursing. Ulceration of the nipples is another and common cause.

Clinical Features of Indigestion.—Whenever the milk of the mother is defective in quantity or quality, the child is apt to suffer. It does not thrive or grow at the normal rate. Instead of being plump and firm and happy, it is soft and flabby, and is always crying, and never appears to be satisfied. Its skin is harsh and dry. The tongue is somewhat red, often slightly furred. Vomiting is not unfrequent from gastric catarrh. The stools are unnatural, and present various appearances depending on the quality of the milk. They are generally loose, and seldom have the natural mustard colour or consistency; but are usually pale, and often of an ashy gray colour, sometimes greenish, or mixed gray and green. The soft curd of the mother's milk is present undigested in little granular-looking masses. There is an excess of mucous secretion, sometimes little streaks of blood. As a rule, indigestion of mother's milk is more frequently intestinal than gastric, diarrhœa being more common than vomiting. This appears to be largely due to indigestion of the fatty and proteid elements of the milk. Infants, in regard to their digestive capabilities, are but little men and women, and it is certain they have their idiosyncrasies likewise. The milk of a mother seems to be suited to her own child under physiological conditions. It has been proved over and over again that a child which is thriving on its

own mother's milk if put to another may suffer, even although the woman is healthy and her milk be found on analysis to be of good quality. This is one of Nature's mysteries which it is difficult to explain, but yet remains as a fact demonstrated by observation and experiment. It shows how subtle and delicate the nutritional relations are between mother and child. If this be so in natural feeding, it helps to explain the difficulties which we encounter when we come to rear the child artificially. Before referring to the indications for the management of disturbed lactation, I shall take as a text two clinical illustrations of indigestion in infants, from notes of many such cases.

Case I.—A girl baby; mother a multipara, who had nursed two other children during the normal period, consulted me about her baby three months old. This lady had always enjoyed good health, and I had not seen her since giving up attendance after her confinement, when lactation was going on satisfactorily. She stated that the child was not thriving so well, although she believed she had plenty of milk. It had frequent crying fits soon after taking the breast, and the stools had become too frequent and unnatural-looking. I found the baby did not look very ill, but it was irritable, and its limbs were wanting in firmness and plumpness. The motions, of which there were seven to eight in the twenty-four hours, were softer than normal and of a grayish colour, with a little undigested curd and some excess of mucus. The mother looked fairly well, and stated she felt in her usual health, although sometimes tired when she had a bad night with the baby. Her breasts were not quite so plump as they should be. It being the winter season, she stated she had been going out very little except for an occasional carriage drive; her appetite was good. She took three meals during the day and some supper at night, consisting of cocoa and milk, or warm milk and water, with bread and butter, and sometimes an egg. Her other meals—breakfast, luncheon, and dinner—consisted of the ordinary home diet, tea and eggs or fish to breakfast with bread, meat luncheon, and a dinner of five courses with claret. The milk was next examined. On being drawn off it had a rich appearance like cow's milk, with high sp. gr. 1034, and on standing for twelve hours there was a very thick cream. Judging by Holt's rule for roughly estimating the constituents of milk, it contained an excess of fat and proteids; an excess of fat alone with normal proteids would have lowered the sp. gr. I was now in a position to tell the mother what to do, and I first of all advised her that I was hopeful that a little change of diet and regimen would enable her to continue to nurse her baby, and my prognosis was justified by the result. Judging that she was living too high as regards the proportion of animal food in her diet, and taking too little exercise, I altered the conditions, and allowed her a plain breakfast without animal food, her usual luncheon, and a modified dinner in the evening,—no red

meat, only fish or fowl, and only two courses. She was also ordered a walk from two to three miles every day when the weather permitted. The child was not otherwise treated. In the course of a week there was a marked improvement. The baby was more contented and the stools became more natural. She went on nursing till the sixth month, when the milk supply becoming somewhat deficient, a little substitute feeding was added, a bottle alternating with the breast during the day. All went well till the child was weaned at eleven months.

Case II. was of a somewhat different nature. The baby was four months old. I saw it in consultation with a medical practitioner in the country. The mother was healthy; the breasts and nipples were well formed. Her hygienic and dietetic habits were satisfactory. She was a woman of somewhat neurotic disposition, intensely sensitive and fond of her infant, and could not bear to hear it cry. The child was fairly well nourished and healthy-looking, but it had frequent crying fits and some diarrhœa. On examining the stools, they were badly formed, of a greenish colour, with a good deal of watery secretion; there was occasional vomiting. The child's tongue was red and irritable-looking, and the mother said it always wanted a drink, and nothing else would satisfy it. On inquiry I found it got the breast at irregular intervals, and whenever it cried. The milk was examined, but only ocularly, as I could not get sufficient quantity for careful testing, but I had little doubt, from the general symptoms and clinical features of the case, that it was one of irregular and too frequent suckling, producing concentrated milk, and I felt tolerably confident that a regulation of the periods of suckling would improve matters. I accordingly encouraged the mother by telling her she was over-anxious about nursing her baby, that she was only to give it the breast every two hours or two hours and a half, if possible, and on no account oftener. She was advised to give the child some sterilised water when it cried for a drink between the nursings. In this case the results were most satisfactory, and the mother was able to nurse her baby, I was told, for some time with good results.

These two cases are very ordinary ones, and typical of two of the conditions giving rise to indigestion in the infant. Irregular suckling is one of the commonest causes of indigestion in babies. It produces a milk too concentrated, which inevitably causes indigestion in the child. Regulation of the suckling is generally sufficient to give relief. Irregular suckling may be due to two principal causes. It may occur in cases where the milk is normal in quantity and quality, from bad habit on the part of the mother in being over-anxious about her child, and carelessly giving it the breast at irregular times or whenever it cries. The more frequent cause, however, is deficient quantity of milk. In this case the child is unsatisfied and gets the breast too frequently in consequence, with the result that the milk becomes too con-

centrated and causes indigestion. The remedy is the addition of some substitute feeding.

With regard to the management of indigestion generally, we must ascertain the cause, and look to the mother and her habits. We should carefully examine the breasts and the milk, and the evacuations of the child. In this way we are enabled to arrive at a conclusion as to the cause of the indigestion in the greater majority of cases. I have already alluded to the general health of the mother as affecting the milk supply. If there is any disease, functional or organic, of a persistent nature, the case must be considered in all its bearings, and a decision come to as to the possibility of continuing lactation with any prospect of success.

The occurrence of menstruation is one that requires careful consideration in regard to nursing. Analyses show that during the menstrual period the milk is deteriorated in quality, and gives rise to more or less disturbance, often of a trivial nature, in the child. On the cessation of the menstrual flow there is generally a return to normal conditions as regards the quality of the milk, so that menstruation in most cases is not a bar to nursing. It may come on a few months after lactation has commenced, and not recur for several months, so it is undesirable to wean the baby if it can be avoided on the occurrence of the first menstruation. It is a very different matter when *pregnancy* occurs. In this case it is necessary and desirable that the child should be weaned.

The diet and regimen of the mother during lactation is of the first importance. It must be borne in mind that the whole process is a physiological one, and that a healthy mother requires really no special treatment during the nursing period. She ought to take her usual food, a plain and mixed dietary, and have a due amount of open-air exercise. A good nurse generally has an excellent appetite and digestion, and is usually able and ought to eat a somewhat larger quantity of food than at other times, and probably a shorter interval between meals may be advisable. She should have a late meal, and in the early morning some soup, or a glass of milk or cocoa and a biscuit or bread and butter. It is desirable that a mother in good average health should fulfil the maternal duty of nursing her child if possible. Many mothers are too apt to seize the opportunity, if anything is wrong, to give up nursing, and in this they are often influenced by the father, who ought to be out of court in such matters. Medical practitioners are apt in many cases to give in to the wishes of the parents in this respect instead of encouraging the mother to nurse her child, and counselling patience and rational treatment with a view to improve the milk supply. I, therefore, conceive it is our duty to encourage mothers to nurse their children if there is no distinct contra-indication. Inquiry must be made into the habits and hygienic conditions under which the mother is living. The milk must be examined, and will not fail to give us valuable information. If it is

deficient generally in quantity, we must endeavour to inspire hope in the mother that she may yet be able to nurse her child; and if her appetite and digestion are good, advise her to take an increased quantity of the lighter and more quickly digested nutriments, with plenty of liquid. If she has too much milk, the fluids must be reduced and the solids increased. Irregular suckling must be prohibited, as a common cause of indigestion in the infant. If chemical examination of the milk shows increase or diminution of the proteids, fat, or solids generally, we must prescribe accordingly. To increase the solids, give the child the breast more frequently, prevent the mother from over-exerting herself, and do not let her drink too much. To decrease the solids, order longer intervals between the nursings, more exercise, and a larger amount of fluid nutriment. Increase of fat indicates the need of less animal food in the dietary. Diminution of fat requires a larger quantity of animal food. The most certain way of regulating the amount of proteids is by muscular exercise, allowing plenty of exercise if the amount of proteids is too large, and decreasing the amount of exercise if they are deficient.

In conclusion, I would like to say that it seems to me more than ever necessary to impress on students and young practitioners the need and importance of the study of that part of preventive medicine which deals with the food supply, whether natural or artificial, of our infant population. Happily, greater facilities are now given for this in the longer period of study required for medical degrees. Inseparably connected with the question of maternal feeding is the no less important one of the artificial rearing of infants who are unable to obtain breast milk. The huge mortality of infants under one year is hardly reduced to a lower level than it was half a century ago, when in England and Wales no less than 76,328 children under twelve months died, out of a total of 350,101 deaths in one year. Want of breast milk and bad artificial feeding are largely responsible for this. Surely it is our duty, as a profession, to try and stem this tide of mortality. I know of no way to attain this end but by education—medical education; and let us hope that in the near future we will be in a better position in this respect, and have greater facilities for showing good results in what, it must be admitted, is an important branch of preventive medicine, too much neglected in this country.

Dr James Ritchie said that while he agreed in the main with Dr Carmichael regarding the influence of the higher, or university education of girls, he would like to acknowlege the distinct advance which had been made in their physical training. With regard to the constitution of nursing mothers, he found most trouble with those of rheumatic tendencies; their milk was not satisfying to the child, liable to cause flatulence and green stools. He found

that in such cases, when the child suffered, it was benefited by putting the mother on anti-rheumatic treatment. Although nursing women could with advantage take and digest a larger amount of food than it was possible for them to do when not nursing, he occasionally found that, in their anxiety to have an abundant supply of milk, they so pressed their feeding as to induce indigestion, and thereby either diminished the flow or perverted the quality. The cure lay in regulating the mother's diet. Regarding the child, he would exclude from the category of indigestion those cases in which the baby drank quickly, overfilled its stomach, then rejected a large or a small quantity immediately it was taken from the breast. He found that babies had idiosyncrasies as well as adults; some of them were always ill after certain articles of diet had been taken by the mother; other children did not suffer although the mother took fruit or vegetables. He agreed with Dr Carmichael that babies should not be too frequently fed, and he thought it very prejudicial to teach a child that it would be nursed immediately it cried. Babies were liable to catarrh of the digestive organs from cold in the same way as older individuals; the treatment was to rest the stomach; and he had seen many cases of sickness, which the mother had vainly tried to stop, cured by withholding the breast for six or eight hours, and giving only a few teaspoonfuls of water every hour. Babies were also liable to flatulence and colic, because of the presence in their intestinal canal of micro-organisms. These were sometimes cured by a single dose of castor oil, although other cases were very troublesome.

Dr Keppie Paterson said that most had probably had experience of the benefits of regular nursing. The breast secretion was largely under nervous influence, and the amount tended to accommodate itself to the requirements of the child, the necessities of the child reacting on the mother. It was necessary also to examine into the saline constituents of both breasts, having seen a case at one of the Children's Polikliniks in Berlin, where a mother stated her child would not take the milk of the left breast as it was salt. Some of it was drawn off and tasted, and her report was found to be true. The infant was being nursed on the right breast, and its secretion seemed normal. The left breast was smaller than the right, but not atrophied. The subject of green stools had not been cleared up. Biliverdin was due to the oxidation of bilirubin; this meant the presence of air beyond the duodenum probably swallowed in excessive quantity along with the milk, and also some alteration of the bile, as the stools do not become green on exposure to the air.

Dr J. W. Ballantyne thought it was often most difficult to be quite sure that breast babies were really receiving only breast milk; he believed that in many cases mothers and nurses were in the habit of adding cow's milk, rusks, etc., as occasion offered,

and yet the children were called breast babies. Indigestion might be due to the administration of sweetmeats. The medical man might be quite deceived. He believed the green colour of the stools was due to micro-organisms.

Dr Church spoke of the importance of mental tranquillity on the part of the nursing mother, and referred to cases where irritation or passion so altered the character of the mother's milk as to seriously injure the infant.

Dr J. Halliday Croom congratulated Dr Carmichael on his excellent and exhaustive paper on this important subject. There were, however, one or two points on which he did not agree with Dr Carmichael. In his experience, a well-managed hand-fed baby was just as good as a breast one, and thrived as well. For the mother's sake, no doubt, lactation was advantageous, favouring, as it did, the involution of the uterus, and was beneficial in other ways. Further, he found that many mothers were quite unable to nurse, however much they wished to do so, and this was especially the case among the better class of patients. He thanked Dr Carmichael for the paper.

Dr Rattray, Portobello, along with previous speakers, said he had derived great benefit from the interesting and practical paper just read by Dr Carmichael. In these cases he (Dr Rattray) invariably made particular inquiry as to the health, diet, and surroundings of the mother, and strongly advised that healthy mothers with plenty of milk should suckle their babies in preference to bottle feeding. He related an instance in which the infant was peevish and wasting on the bottle, but picked up and greatly improved when fed on its mother's milk exclusively.

Dr James Carmichael, having thanked the Society for the reception given to his paper, alluded to the remark of Dr Croom with reference to the healthiness of artificially-nursed infants compared with breast babies. He agreed with him that equally healthy children could be reared by substitute feeding if carefully regulated, and among the better classes this could always be done; not so with the poorer classes, where there was a large mortality in bottle babies from careless feeding. He was glad Dr Church bore him out in regard to the importance of encouraging and inspiring hope in the nursing mother. With reference to the study of green evacuations, recent observations seemed to show that various forms of bacteria played an important part in the rôle of causation. He was glad to find that Dr Ritchie admitted that overwork in school girls often affected their general health and tone in such a way as to render them less fitted for the maternal duty of nursing in after years. He quite agreed with Dr Underhill that in those cases where there was an excessive quantity of milk the quality was so defective as to render the secretion unfit as a nutriment for the infant. He found in his own experience that bottle-feeding alternating with the breast gave satisfactory results

for a time. In conclusion, he would remark that his object in directing the attention of the Society to this subject was to emphasize the necessity of advising a mother to nurse her child whenever possible, and also to prove that temporary disorders in the child associated with some alteration in the milk could in many cases be remedied by suitable treatment of the mother, thereby enabling her to continue lactation.

III. ON PERIPHERAL NEURITIS IN PREGNANCY.

By George Elder, M.B., M.R.C.P. Edin.

The cases of peripheral neuritis recorded bearing a direct relationship to the pregnant state are at present sufficiently rare to be of interest even when they are comparatively mild. The following two cases have recently come under my notice, and seem to be worth putting on record.

Case I.—A married woman, aged 33 years, was first seen on December 11, 1895, when she complained of want of power and tingling in both hands, which had lasted about two months. She had had already eight children, all born healthy. No miscarriages had occurred. In one of her previous pregnancies (seven years ago) she was said to have had "kidney disease" when five months pregnant. She had not at that time any severe symptoms; there had been no fits, nor had there been any condition like the present, and at full term she had been delivered of a healthy child. Never at any time had she had any tingling in the hands or feet or want of power in them. During her present pregnancy she had suffered from nothing further than a sore throat till the present symptoms commenced. The sore throat only lasted a day or two; there were no others in the neighbourhood affected so far as she knew, and, in fact, there was no reason whatever to think that it might have been diphtheria, as she had often such sore throats, evidently exacerbations of the granular pharyngitis present. When about six months pregnant she began to be troubled with tingling and feelings of "pins and needles" in her right hand, especially at nights. These got worse, shooting pains began, and then the hand began to feel cold and she could not use it as she was accustomed to. She was often kept awake at night by the sensations in it. Soon the left hand began to suffer in the same way, and quite lately she had had a numb feeling about the left haunch. On examination she was found to be a healthy-looking woman, eight months pregnant. She had slight headaches, but no sickness, vomiting, or affection of eyesight. There was neither albumin nor sugar in the urine. The heart was quite normal. Some granular pharyngitis was present. She

did not look alcoholic, and declared she was very temperate. Her hands troubled her greatly, the shooting pains and tingling and feelings of heat and cold being at times very severe. She dropped things out of her hands, and could not do any fine work. She could grasp kettles, etc., which were far too hot for anyone else to lift, and had no feeling of heat in doing so. The hands were cold; there was no wrist drop. She could grasp pretty firmly with both hands, though she often dropped articles after she had taken them up, evidently from affection of sensation. In both hands sensation was dulled, more in the right than in the left, pain, tactile sensibility, and sensation of temperature all being affected. The feet were not affected apparently. There was no tenderness on pressure along the line of the nerves. She was confined on February 4, 1896, and had a good puerperium. The symptoms began to pass away immediately after delivery, and in from three to four weeks she was quite recovered, except for a very slight tingling in the hands.

CASE II.—A married woman, aged 37 years, was seen at her confinement. This was her eleventh child; all of them had been healthy and no miscarriages had occurred. There was no history of syphilis, and she was not alcoholic. She had not suffered from sore throat of any kind. No trouble with her urine had occurred. No symptoms of poisoning by lead or other mineral poison were present. She had never suffered in the same way before. When about six months pregnant she began to suffer from tingling and want of feeling in her fingers. Paræsthesiæ became severe and loss of feeling greater; she dropped things, and she could not knit or do fine work with her fingers. Some weeks before delivery similar symptoms came on in her feet, and had been getting worse. On examination there was found to be distinct impairment of sensation both in the hands and feet, most marked on the palmar and plantar aspects, pain and temperature being more markedly affected than touch, though this also was affected. There was no foot or wrist drop, and the patient could grasp the hands firmly. The plantar reflex was not gone, or the knee jerk. No tenderness on pressure along the line of nerves was present. After delivery the sensations began gradually to trouble her less, and three months afterwards she was quite recovered, except for slight tingling at times in the hands, the objective affections of sensation being quite gone.

There can be little doubt that these were cases of peripheral neuritis, though very mild in type. So far as one could ascertain (and in the second case her history for some years was known) no other cause for the condition beyond the pregnant state could be found. The patients were not alcoholic, there was no trace of syphilis, or of poisoning by lead, arsenic, or other mineral

poison. There was no diphtheria (the slight sore throat in the first case was, no doubt, from the exacerbation of the pharyngitis), and there was no trace of albumin or sugar in the urine. Influenza, gout, typhoid fevers, pneumonia, etc., could all be excluded, and therefore one has to conclude that the peripheral neuritis was the result of the gravid state, a conclusion corroborated by the fact that recovery began as soon as delivery had taken place.

As has been already stated, the recorded cases of peripheral neuritis closely associated with pregnancy are very few. They have mostly been described as a variety of the peripheral neuritis of the puerperium—"polyneuritis puerperalis"—many of which, though only noticed during the puerperium, are thought by Eulenburg and other writers on the subject to originate during pregnancy. The subject of puerperal polyneuritis was first thoroughly investigated by Möbius, although previous records by Lever, Imbert-Gourbeyre, Kast, and others, were evidently examples of the disease. Writing in February 1895, Eulenburg was able to collect thirty-eight cases of puerperal polyneuritis (including one or two cases of polyneuritis occurring during pregnancy). The polyneuritis of the puerperium is now generally divided into two classes:—1. The generalised or diffuse form, affecting both the upper and the lower extremities. Here the affection usually resembles in onset and in character a case of ordinary alcoholic polyneuritis. It may, however, begin in the lower extremities and rapidly affect the upper extremities and the trunk, and so closely resemble Landry's paralysis (as in one of Eulenburg's cases), or it may begin by affection of the muscles of the palate and eyeball, and spread to the limbs, so resembling a severe case of diphtheritic paralysis (as in Lunz's case, where diphtheria could evidently be excluded). 2. The localised form. Of this there may be said to be two types: (*a*) affecting the superior extremity, and (*b*) affecting the inferior extremity. (*a.*) The "superior" type is specially interesting because it was the type in most of the cases first described by Möbius, and has frequently been observed since. Möbius was inclined to think that it was of special diagnostic value, for he thought that just as certain nerves are evidently specially susceptible to the poison of diphtheria—viz., those of the palate and eye—and certain others to the poisoning by lead—viz., those supplying the extensors of the wrist—so the nerves which are specially susceptible to the poison produced during the puerperium were the ulnar and median nerves. Although in some cases recorded since then the median and ulnar nerves were not at all affected, still it is a remarkable fact that in a comparatively large proportion of cases of puerperal polyneuritis these nerves were chiefly or alone involved. (*b.*) The "inferior" type. Here the antero-lateral aspects of the legs are involved, leading to sensory phenomena

in that region together with a greater or less degree of drop-foot. All cases, however, with such affection of antero-lateral aspect of the leg coming on after delivery are not cases of peripheral neuritis, but may be the result of:—1. Traumatism from pressure of the head or forceps on the nerves inside the pelvis during labour, especially in narrow pelves. Here the paralysis and affection of sensation in the leg comes on immediately after labour, and is usually unilateral. 2. Infiltration at the side of the uterus leading to pressure on parts of the nervous plexuses in the cavity of the pelvis. Here, also, the antero-lateral type of paralysis is the form observed. No such variety of type has been described in the polyneuritis of pregnancy as has just been described in the polyneuritis of the puerperium, and the symptoms correspond to those seen in ordinary alcoholic peripheral neuritis, and so need not be discussed further than by saying that usually the affection begins with paræsthesiæ more or less severe in the extremities; then paresis appears (specially affecting the extensors of the wrist and the flexors of the foot) and spreads to a greater or less extent, the electrical reactions corresponding to the rapidity of onset of the disease. There are also objective affections of sensation and perhaps trophic lesions. In the cases I have just recorded there were marked paræsthesiæ with objective affections of sensation, but the paresis was extremely slight, if present at all.

Etiology.—The first point to determine in discussing this question is to make thoroughly certain whether the peripheral neuritis is the result of the pregnancy, or whether the neuritis and the pregnancy are merely coincidental. In practically all the cases described the ordinary causes of neuritis could be eliminated—*e.g.*, alcohol, diphtheria, syphilis, lead, arsenic, etc., typhoid fever, pneumonia, influenza, and so on. Some of those which have been usually accepted as being cases of peripheral neuritis of pregnancy have, indeed, been objected to as being possibly of some other origin. Thus the case of Desnos Joffroy and Pinard—one of the first described—has been objected to by Lunz on the ground that owing to previous hæmorrhages the woman was anæmic, and possibly the anæmia was the cause of the neuritis. Whilst recognising that many cases of peripheral neuritis occurring during pregnancy may be quite independent of the pregnancy, or that the pregnancy is not the sole or even the chief cause of the neuritis, but merely determines the time of onset of the disease (through the extra strain thrown on the system then, just as any other debilitating influence might determine the time of onset of the condition, there being behind it some more important recognised cause of neuritis), still there are some cases, including my own, which appear to prove that the pregnant state of itself may lead to the onset of the disease. This seems to be proved by the fact that no other cause for the condition could be discovered, and especially that

immediately after delivery the symptoms began to disappear. If we accept, then, that there are cases of peripheral neuritis due to the gravid state, how are we to explain the onset of the disease? Here, again, it might be well to look for a moment at the disease occurring during the puerperium. In most of the cases of puerperal polyneuritis there was a distinct history of fever during the puerperium, so that there is much reason to believe that they were really cases of septicæmic neuritis. Some cases, however, have been described[1] where the puerperium was said to be fever-free, although apparently in few of them was this point specially observed, as the cases only came under the notice of the observers some time after the onset of the disease. In such cases, even should it be proved more satisfactorily than at present that the puerperium was fever-free, there is in the process of involution of the uterus, etc., and consequent presence in the blood of a quantity of products of disintegration, a possible cause of poisoning of the nervous system. Similarly in pregnancy one has in the greater amount of relative changes going on, as a consequence of the growth of the embryo *in utero*, a larger quantity of effete products to be eliminated from the system, and it is probable that this is largely the cause of the neuritis when it is present; for the excretory organs may at times be unable to fully eliminate from the circulation all these products, although they do not give any actual signs of being themselves diseased. It is true that in nearly all the cases recorded of peripheral neuritis in pregnancy there has been severe vomiting lasting for a considerable period (as in the cases of Desnos Joffroy and Pinard, Whitfield, Polk, Solowjeff, and Stembo), and this has been accepted by most of the writers as the cause of the neuritis. That it is closely related to the neuritis there can be apparently little doubt, and this relationship is more strongly brought out by the fact that in several cases of puerperal polyneuritis there had also been excessive vomiting during the pregnancy (cases of Soltas, Lunz, Eulenburg, and others). But that it is absolutely necessary for the production of the neuritis of pregnancy seems to be disproved by the cases I have just recorded, where it was quite absent, and it would be well to bear in mind the possibility of the vomiting being rather a concomitant symptom. Eulenburg, in his careful paper on Puerperal Polyneuritis, is inclined to believe that some of the cases of neuritis, though only observed during the puerperium, are in reality cases of neuritis of pregnancy, and thinks that the impaired gastro-intestinal functions during the gravid state are the cause of the condition by leading to an auto-intoxication through the formation in the gastro-intestinal tract of some substance, possibly acetone, which is absorbed and causes the neuritis. There is, however, really no evidence whatever that acetone is the cause of the condition. That it is a toxæmic polyneuritis there can be little

[1] Möbius, second paper, 1890; Lunz, etc.

doubt, but as to the nature of the poison there is no evidence whatever. Why it should come only in a few cases it is difficult to see, but in other forms of peripheral neuritis there is a similar difficulty, for one person may consume for a similar or longer period of time vastly greater quantities of alcohol than another and yet not acquire alcoholic neuritis though the other does. It is a remarkable fact that in the cases of neuritis of pregnancy recorded, and, indeed, in those of puerperal polyneuritis as well, there are extremely few occurring in primiparæ. Considering that almost certainly the disease is toxæmic in nature, this is worth attention, for *à priori* one would have expected a relatively larger proportion of cases to have occurred in primiparæ, when the strain of pregnancy is for the first time thrown on the organs of the body. As regards the frequency of occurrence of neuritis of pregnancy I have only been able to collect eight cases (including those of Lever and Jolly, about which there is some doubt). This, however, is, I am convinced, no guide to the frequency of its occurrence, for in its milder form at least it must, I think, be fairly common.

Prognosis.—There are at least two fatal cases amongst those reported of peripheral neuritis in pregnancy—viz., those of Solowjeff and Polk. In the latter case the fatal issue was evidently the result of cystitis and pyelitis, but what the relation of these was to the neuritis, if any, it is difficult to say. In the other cases the recovery was in some very tardy, and in others fairly rapid. In my own cases, much milder than any others recorded, recovery began immediately after delivery; in one case it was complete in several weeks, and in the other in three to four months.

Treatment.—Remembering the fact that the disease may prove fatal, one must be prepared to induce labour before the disease has advanced too far, for as soon as the uterus is emptied there is naturally a tendency to recovery. One would require, however, to be particularly careful, in inducing labour, to prevent the onset of the slightest degree of septic trouble, which would tend to aggravate the condition, for, as we have seen, nearly all the cases of peripheral neuritis have followed on a fevered puerperium. Otherwise the treatment of the condition would resemble that in other forms of peripheral neuritis.

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Puerperal Polyneuritis.

EULENBURG.—*Deutsche Medicinische Wochenschrift*, 1895, Nos. 8 and 9, where practically all the literature up to the date of the article is given.
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Dr James Ritchie said that the Society was indebted to Dr George Elder for having brought this somewhat rare disease before them in so able a manner. He thought that he had made good his argument in favour of pregnancy as a cause of the disease, because for the production of certain nerve disorders there were required—*first*, a peculiar constitution of the nervous system which predisposed; *second*, some debilitating influence which lowered the nerve tone; *third*, some exciting cause. Dr Elder had indicated, in some of the cases referred to, the debilitating influences of repeated pregnancy and vomiting, and that during pregnancy there might exist in the blood some morbid material which was capable of acting as a poison on the nerve centres. He had further showed that when pregnancy was brought to an end the disease was recovered from.

Dr J. W. Ballantyne was struck by the difference in symptomatology which Dr Elder's case showed as compared with (*e.g.*) Solowjeff's; so great was the difference that variations in the degree of the manifestations seemed scarcely sufficient to account for it. He had listened to the paper with very great interest.

Dr Keppie Paterson said Dr Elder's cases had commenced in the later months. He had a case beginning in the middle of pregnancy. She was a multipara with four children. There was no albuminuria, and it commenced before there could have been pressure on the renal veins; anasarca developed in the later months. At delivery she gave birth to twins. The disease seemed to be due to what Sir Andrew Clark called insufficiency of kidney action. In this case her kidneys were capable of excreting the effete products of one

child, but were insufficient when there were two children *in utero*. The neuritis was a disease of the nervous system, but there must be a cause behind that, and it was probably associated with deficient excretory power in the kidneys.

Dr Milne Murray recalled a case which occurred in his practice some years ago, and which had a bearing on the relation of peripheral neuritis in pregnancy, though of a somewhat different nature to that observed by Dr Elder. Dr Murray was called to see a lady suffering from severe pains in her hands and feet, which at first he was inclined to suppose were of a rheumatic character. The patient, whom he had only seen once some time before, and with whose previous history he was very little acquainted, had a distinctly alcoholic look. Leaving town for a holiday after his second visit to her, the case was taken charge of by Dr Alexander Bruce, who soon diagnosed it as one of severe peripheral neuritis. On Dr Murray's return the symptoms were very acute. The husband declared it to be impossible for his wife to be indulging in alcohol, as he kept the domestic supply under lock and key. The symptoms continued with varying severity for many months, the most marked improvement having occurred when a nurse came into charge during a prolonged absence of the husband. On his return the nurse left, and the patient immediately became worse. She had been married for eight years, but had been sterile. About three months after the husband's return she became pregnant, and by the fourth month of pregnancy the symptoms had almost, and at the sixth month had altogether gone. She went on to the full time and was safely delivered, and since then—now six or seven years—there has been no return. The causation of the neuritis came out nearly a year after her confinement, when the husband discovered that she had been obtaining large quantities of Eau de Cologne from several chemists. The supplies were introduced into the house by the aid of a young servant, who was in her mistress' confidence, and who had acted as an intermediary; and the patient confessed that she had indulged very freely in this stimulant, and had disguised the odour by chewing coffee. It is probable that after the occurrence of pregnancy she was able to break off the habit, though she was never very clear as to when she gave up the indulgence.

Dr Lamond Lackie said that Dr Elder's cases recalled one of which he had charge some years ago. A lady when three months pregnant suffered from a severe attack of influenza, and thereafter developed all the symptoms of peripheral neuritis. She went from bad to worse, until at the sixth month she was delivered of a dead-born child. From that time she began to improve, and after eighteen months was nearly well. There was no doubt the attack of influenza was the primary cause of the neuritis, but the gravid condition seemed to aggravate the symptoms.

Dr Halliday Croom said he thought Dr Elder's paper most interesting. He had not met with many cases of peripheral neuritis during pregnancy, and he had never considered the condition as due to the gravid state. In all cases of neuritis he suspected alcohol as the cause, and generally he succeeded in discovering it. He observed that Dr Elder's cases were both multiparæ. He was sure the Society was very much indebted to Dr Elder for bringing before it this very interesting subject.

Dr Elder, after thanking the Society for the way it had received his paper, referred to the causal relation of pregnancy to peripheral neuritis. The number of cases of neuritis in pregnancy reported were few, because neuritis was comparatively rare in females as compared with males, and because cases where a distinct cause apart from pregnancy, *e.g.*, alcohol, was present, were not likely to be reported. That in many of the cases pregnancy was the exciting cause of the neuritis seemed to him to be beyond question, for as soon as the pregnancy ceased there was at once an amelioration. He did not mean by saying that there were cases of "neuritis of pregnancy," that a normal pregnancy could cause neuritis; but that apparently owing to some defect in the excretion of the increased waste products then in the system, not accompanied by any definite lesion at present discoverable in the excretory organs (or by derangement of the gastro-intestinal tract), pregnancy was the chief factor in the causation of some cases of peripheral neuritis; and he was of opinion that such cases, in a mild form, were by no means rare. There were so many possible causes of peripheral neuritis that it was extremely difficult to eliminate them all, but so far as was possible to him he had done so in the cases he had reported, and there remained no apparent cause but the pregnancy, and as they both improved after delivery, it was almost certain that the pregnancy had a definite and direct relation to the neuritis.

IV. TWO TERATOLOGICAL CASES.

By Dr Mark Günsburg (Charkow, Russia).

(Translated and Communicated by Dr J. W. Ballantyne.)

Abortion of Four Fœtuses, one of which was Monstrous.

A peasant woman, 20 years of age, in the fourth month of her first pregnancy, was at work towards the end of summer in a field nearly two kilometres distant from her home. In the afternoon she felt some pains in the lower part of the abdomen, and lost much blood; soon a small fœtus, well-formed, and of the male sex, was expelled, and the pains ceased. Returning on foot to her home, she passed the night and the next day quietly; but at six

o'clock in the evening the pains returned. I was sent for, and found the uterus to be very large; a thread of umbilical cord was outside the vagina. By compression from above I delivered a second and then a third fœtus. Afterwards I passed two fingers into the vagina, to extract the placenta; but in front of it and in place of it I found in the uterus a fourth fœtus, which was removed along with the placentas. The puerperium was not marked by any feverishness, and the young woman recommenced her ordinary work on the fifth day after the miscarriage.

The first fœtus was buried in the country; the other three were secured by me for examination. The second and third fœtuses were normal; the fourth was a monstrosity. The detailed description of it may here be given.

The head resembled a fleshy malformed mass, broad in its upper and narrow in its lower part. In the cranium the occipital bone was absent; the frontal bones also were abnormal, for their facial parts were wanting. The eyes, mouth, and ears were absent; the nose was normal. In the middle part of the face and from prominences corresponding to the zygomatic bones two muscular masses passed downwards, and ended by converging in the region of the clavicles. Similar muscular masses passed from the posterior part of the head on to the back.

The sternum was absent. In its place was a thin membrane, under which one could see the organs of the thoracic cavity. The upper limbs were deformed. The forearm ended in three eminences, resembling fingers. The abdomen showed a fissure through which a portion of the intestine was prolapsed. The genital organs (male), consisting of a penis and scrotum, were normal.

Certain facts regarding the dimensions, etc., of the fœtuses may be presented in a tabular form:—

Table of Measurements, etc., of Quadruplets.

No. of Fœtus.	Length of Fœtus.	Circumference of the Head.	Diameter of the Shoulders.	Diameter of the Pelvis.	Occipito-mental Diameter.	Mento-bregmatic Diameter.	Claviculo-pubic Diameter.	Claviculo umbilical Diameter.	Umbilico-pubic Diameter.	Length of Lower Limbs.	Length of Upper Limbs.	Genital Organs.	Placentas.	Umbilical Cord.
1st.	Unknown.											Masculine.	Three placentas united in one sac, 11 × 8, and one separate placenta.	Central insertion, length 15 cms.
2nd.	18	13	4	3	10	6	7	5·5	1·5	6·5	7	Feminine.		
3rd.	16	13·5	4·5	3	9	5	9	6	3	6	6·5	Masculine.		
4th.	13	11	4·2	3	9·5	6	4	3	1	4·5	2·6	Masculine.		

All the measurements are given in centimetres.

A Cyst on the Back of the Infant, simulating the Head of another Infant.

I was called to attend a woman 27 years of age, and the mother of two living children. Her third confinement was abnormal. At the moment of my arrival the head of the infant was already outside the vagina; the expulsion of the trunk, however, was hindered. The infant was dead. I introduced one finger, and afterwards half my hand within the genital organs of the parturient, and there I found a tumour simulating the head of another infant, belonging, as I supposed, to twins united together. But a more complete examination showed that the tumour was rounded, not very hard, had no sutures or fontanelles, and gave a feeling of fluctuation like that of an indiarubber ball well filled with water; the skin covering the tumour showed no hairs. I asked for a consultation with my worthy colleague, Dr Favre, to whom I wrote asking him to bring a perforator. He agreed with me that we had to do with a tumour full of fluid. I punctured it and immediately a large quantity of serous fluid escaped, and afterwards the trunk of the infant was extracted without any difficulty.

On the back of the infant was found a sac with a whitish surface like skin, of thickness of from ·5 to 1·0 cm.; it was inserted without a pedicle in the sacro-lumbar region, where could be felt a defect in the vertebræ, a fissure as in spina bifida. There was no other deformity in the infant, which was well developed and of the male sex. The two other members of the family showed no anomaly.

The father gave me permission to send the body of the fœtus to the University, which I immediately did; but two or three hours later the grandfather of the child came to my house in tears, as he did not wish the infant to be dissected, but desired to bury it with the rites of the Church. I gave him a letter to take to the Professor to whom I had sent the specimen, and so the body of the child was returned to him. In this way I lost the opportunity of giving a more detailed description of the tumour.

Notes on Dr Günsburg's Teratological Cases, by Dr J. W. Ballantyne.

Dr Günsburg's second case, which was evidently one of spina bifida of the sacro-lumbar region of the vertebral column, calls for no special comment; but his first observation is, I believe, almost if not quite unique.

Regarding it simply as a case of quadruplets it had a very considerable interest, for such occurrences are extremely rare. In P. Charbonnier's *Étude des Grossesses triples et plus que triples*, published last year (1895), the proportion of quadruplets to single births is given as 1 in 400,000; but some statisticians have placed it as low as 1 in 2,074,306 (Puech), and others as high as 1 in

20,000 (Plenck). In Switzerland, between the years 1881 and 1893 there were 1,108,092 births, of which one only was an example of quadruplets. Of course in dealing with such a rare occurrence the coincidence of two examples within a few weeks of each other will temporarily alter very markedly the proportion; and probably about one case of quadruplets in half a million labours is a fair estimate of frequency. During the last two and a half years a few instances of quadruplets have been put on record, notably one by Bousquet (*Ann. de gynéc.*, xlii. p. 55, 1894); one by Pergamin (*St Petersburg Med. Wochenschr.*, Suppl. N. 1, 1895), and one by Stahl of Chicago (*Trans. Chicago Gynæc. Soc.*, p. 6, 1896).

In several of its details Dr Günsburg's case was in accordance with what has been found to be usual in quadruplets. For instance, three of the fœtuses were males and one a female. According to Charbonnier's statistics, this is not the commonest arrangement, for out of 61 cases he found two girls and two boys in 18; four boys in 13; three boys and one girl in 12; three girls and one boy in 9; and four girls in 9 instances. The pregnancy ended prematurely at the fourth month, and we find that the larger the number of fœtuses *in utero* the greater is the liability to abortion. In Dr Günsburg's observation there were two separate placental masses, one of which was made up of three placentas united into one, and having one chorionic sac, whilst the other was quite single. It may be concluded that the composite placental mass belonged to the three male infants, whilst the single separate placenta was for the female fœtus. This is the most common arrangement, for in 43 instances Charbonnier found in 15 that there were two placentas, sometimes one being very large, with three cords, and the other small, with one cord, sometimes two of nearly equal size; in 14 cases the placenta was single; in 8 there were four placentas; and in 6 there were three after-births, one of which carried two cords. In Dr Günsburg's specimen there seems to have been only one cord (centrally inserted) for the three placentas, making up the one mass, and this is quite in keeping with the fact, to which reference will immediately be made, that one of the fœtuses was a placental parasite of the paracephalic type. It is reasonable to believe that there were two chorionic sacs, one containing the three male fœtuses, and the other the single female; and what occurred seems to have been the rupture of the large sac and the expulsion of one male, then the rupture of the second sac and the birth of the single female; and, finally, the expulsion of the other two males from the first sac. Thereafter the two placentas came away together. Judging from the arrangement of the membranes, the three male fœtuses were developed from one ovum, and the single female from another, so that we may regard it as an instance of binovular plural pregnancy, in which one of the ovules produced triplets and the other a single fœtus.

By far the most important feature of the case, however, was the

condition of one of the fœtuses. From the description of it which the author gives it was evident that it was a paracephalic monstrosity. Now, I have within recent years met with two examples of paracephalus, in both of which the monstrous infant was one of twins, and in the papers on allantoido-angiopagous fœtuses[1] which I have communicated to this Society I referred to two or three cases in which such a monstrosity was one of triplets; *but I know of no case in which a paracephalic fœtus was born along with three other fœtuses.* In this sense Dr Günsburg's observation is truly unique. I have so recently and so fully described the paracephalic variety of the allantoido-angiopagous fœtus, that I need not do more here than repeat, that whilst allantoido-angiopagous twins are rare, and triplets very rare, a case of quadruplets, one of which is paracephalic, such as the present, has not hitherto been reported. From Dr Günsburg's description, it would seem that the monstrous fœtus was supplied with a heart; it was therefore a paracephalus cardiacus.

The two above recorded cases were originally sent to me for publication in the defunct *Teratologia;* but I thought them of such general interest that I asked Dr Günsburg to allow me to read them before this Society, a request to which he gladly acceded.

V. CASE OF CONGENITAL TUMOUR ON THE FACE OF A CHILD.

By J. Rutherford Morison, F.R.C.S.

(With Reports by Mr J. H. Targett and Dr J. W. Ballantyne.)

History of the Case, by Mr J. Rutherford Morison.

John R. C., aged 11 months, was born with the tumour, which has not increased out of proportion to his growth since birth. When he was two months old it began to bleed spontaneously, and he lost a good deal of blood. It has done so several times since, and he has occasionally lost a serious quantity of blood. Lately the bleedings have become less frequent and less severe. There has been an almost constant discharge, yellow in colour, and offensive in smell, which comes from the side of the tumour next the nose. The teeth connected with the tumour were cut with the first ordinary teeth when the child was eight months old.

Family History.—No previous deformity can be recalled on either father's or mother's side. On the mother's side there is a strong tubercular history.

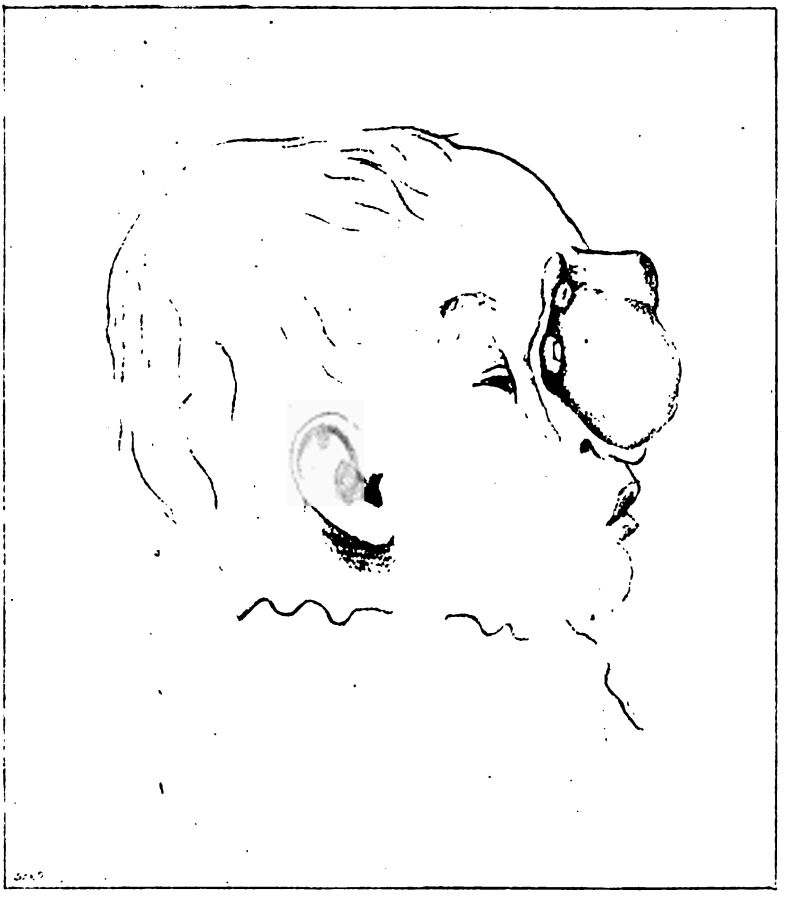
At first sight the tumour looked like one of the large orbital sarcomata frequent in children, for looked at from the front it hid the right eye. The upper portion of it (light-coloured in the photo-

[1] *Trans. Edin. Obst. Soc.*, xviii. pp. 38, 94, 201, and 257, 1892-93.

PLATE I.

Congenital Tumour on the Face of an Infant.

PLATE II.



Congenital Tumour on the Face of an Infant.

graph) was covered with thick skin, the lower (dark in the photograph) with apparently normal mucous membrane. The growth looked as if it was coming out of an opening in the side of the nose, and had carried the skin of the nose forward in its upper part. The tumour was surrounded by a sulcus about half an inch deep, ending blindly. The outer edge of the sulcus surrounding the tumour was specially well-marked and raised into a prominent margin, with two tubercles and a division between (see Plates I. and II.). One of the tubercles had cut a well-developed temporary incisor tooth, the other was about to do so (see Plate II.). The two tubercles looked like two maxillary processes, with a hare-lip between (see Plate II.). The nostrils were normal. The tumour did not communicate with the right one, which reached the pharynx. The mouth and palate were normal. The whole frontal bone on the side of the growth appeared to be much enlarged, but this may have been in part due to an oblique deformity, for the opposite occipital region was less prominent than the right. On the tip of the nose there was a small acorn-shaped projection (see Plate I.), from the apex of which sebaceous matter was expressed by squeezing the swelling. No hair was seen in this matter.

Operation.—A flap of skin was dissected off the growth, and the whole of it removed with a gouge. The edges of skin round the base of the growth were pared, and the flaps sutured to them covered the whole raw surface. The base of the growth was solid, and entirely blocked the upper part of the nose. The child made a good recovery.

The growth, about the size of a Tangerine orange, was divided, and duly sent to Mr Targett for histological examination. There was a dark pigmented streak running through it, probably the result of exploration with a hypodermic syringe some months earlier.

Mr J. H. Targett's Report.

The tumour must be regarded as a teratoma—of the variety known as Epignathus, in which a portion of an abortive twin has been included between the halves of the median cephalic fissure. The imperfect lip and the two tooth germs are sufficient evidence of fœtal elements. Such teratomata usually protrude from the mouth, or from a common naso-buccal cavity the halves of which have been prevented from uniting. In this instance we must suppose that the fissure between the fronto-nasal and right maxillary processes did not close, and the included teratome protruded through the aperture. Hence its partial covering with mucous membrane. Histologically it shows little more than fibrous and mucoid tissues irregularly mingled. No muscle was seen. A piece of hyaline cartilage was attached to one side of the preparation; but this I concluded was cut from the margin of the skull, and

therefore did not belong to the specimen proper. There was no evidence of sarcoma in it.

Lannelongue, in his book (*Affections Congénitales, Tête et Cou*, 1891), refers to several cases under the heading of "Tératomes de la face." Not one of them exactly corresponded with the present case. The nearest were said to have sprung from the body of the sphenoid, or the base of the skull generally, and to have protruded into the nose, mouth, and pharynx, more rarely into the cranium itself. A large proportion of the cases were typical dermoids, but these must be arranged in a separate class.

There is only one specimen in the teratological collection here (Royal College of Surgeons of England). It is a fœtus with an enormous lobulated tumour protruding from the mouth. On the tumour portions of an upper and lower lip with a single nostril can be made out. The rest of the mass has a fibro-vascular structure with cysts containing bones, etc.

Dec. 14, 1895. J. H. TARGETT.

DR J. W. BALLANTYNE'S REPORT.

Through the kindness of Mr Rutherford Morison and Mr J. H. Targett I have been able to examine the photographs and drawings of the case, along with sections of the tumour itself, and at the request of Mr Morison I make the following Supplementary Report.

The mass removed from the child's face is evidently, as Mr Targett remarks, a teratoma, or rather, perhaps, it is "teratoid" in character, for it contains only teeth and mucoid tissue to indicate its fœtal origin. Such a description of it, however, does not tell anything of its mode of origin. It can scarcely be identified as an instance of epignathus, using that word in the only sense in which it has yet been applied. Ahlfeld, for instance, has defined this monstrosity as any case in which an acardiac amorphus is attached to the buccal cavity, and usually to the palate of the twin fœtus; but it must be admitted that Ahlfeld himself does not strictly adhere to his definition, for he includes some instances in which the mass was adherent to the outer surface of the jaws. Taruffi[1] gets over the difficulty by making two varieties,—one, endoprosopus amorphus, which corresponds to the epignathus of Saint-Hilaire, and in which the mass grows from the inside; and the other, exoprosopus amorphus, in which it is attached externally. Mr Morison's specimen might, therefore, be called one of exoprosopus amorphus (although it does not resemble exactly any of the previously reported cases in this group). Of course if this nomenclature be adopted, it practically means the acceptance of the theory that the mass on the external surface of the face is an aborted twin fœtus, a rudimentary parasite.

Mr Morison states that he has a difficulty in accepting this view

[1] Taruffi, C.—*Storia della Teratologia*, iii. p. 131, 1885.

of the case. In his letter to me (April 21, 1896) he says—"It seems to me that a supernumerary superior maxilla would be as reasonable an explanation of the tumour as to say it was an included fœtus of which only the maxillary processes remained." Of course the same objection may be made to the method of classification which places infants with supernumerary digits amongst the parasitic double monstrosities, for it might just as well be said that in them all that remains of the included fœtus is the extra finger or toe. It does seem ridiculous; but it must be regarded as an exigency of the classification which demands the artificial breaking up into groups of a series of specimens which, if we knew all the links, would form a continuous chain. As it is, there are always intermediate or connecting types for which it is difficult to find a place in any scheme of classification, and of such is Mr Morison's specimen. The typical double monster, such as the Siamese twins, is connected with the case in which the only sign of duplicity is an extra finger, toe, or jaw, by a long succession of varieties all differing slightly from each other, whilst the terminal members of the series, of course, show no resemblance at all. In this way the views of Mr Targett and Mr Rutherford Morison may be reconciled. The mass may be regarded as a teratoma, as an exoprosopus amorphus, or as an accessory upper jaw. Of course it is not supposed that a whole twin embryo at one time existed, and that all of it save a part of its upper jaw was destroyed; rather are we to think that the tendency to duplication showed itself only in the upper jaw, which threw out a bud or rudiment of an accessory maxilla. Cases of more or less complete accessory maxilla (upper and lower) are well known to teratologists, although their occurrence is rare. In a case reported by Israel[1] there was found attached to the outer surface of the left side of the lower jaw a supernumerary mandible, consisting of a bone containing tooth germs, a cystic mass, and a rudimentary mouth. In a similar way we may regard the tumour on Mr Morison's little patient's face as a rudimentary superior maxilla containing incisor tooth germs, and consisting partly of bone, partly of hyaline cartilage, and partly of fibrous and mucoid tissue, whilst the ridge round the tumour may perhaps be identified as an attempted formation of a mouth. If this be indeed its true nature, then it would fall to be included in a group established by Gurlt[2] to include one known specimen in the calf, and termed "heterocephalus epignathus," or, to use Taruffi's[3] nomenclature, "pleo-epignathus asimmetrus." But whether it is thus named and classified or not, the case still deserves the epithet of unique in at any rate the human subject.

June 10, 1896. J. W. BALLANTYNE.

[1] Israel, O.—*Ein Fall von Verdoppelung der linken Unterkieferhälfte.* Inaug. Diss., Berlin, 1877.

[2] Gurlt, E. F.—*Ueber thierische Missgeburten*, p. 41. Berlin, 1877.

[3] Taruffi, C.—*Storia della Teratologia*, iii. p. 105, 1885.

VI. TERATOGENESIS: AN INQUIRY INTO THE CAUSES OF MONSTROSITIES.

By J. W. Ballantyne, M.D., F.R.C.P.E., F.R.S.E.

III.—CAUSES OF MONSTROSITIES—(*Continued*).

A.—Theories of the Past—(*Concluded*).

3. *Mental Influence.*

Doubtless some modern writers may be inclined to cavil at the position which is here assigned to the theory of the influence of the maternal imagination in teratogenesis, for it is placed with the notions of the past, and not with those of the present. But I think that the arrangement is warranted, for it must be admitted that the theory of maternal (or paternal) mental influence as originally enunciated is indefensible. At the same time, the belief has a modern side, infinitely less repulsive to the scientific sense of inquiry; this side has, I believe, a just claim to credit. The hypothesis as originally stated is, I humbly think, untenable; it is truly a theory of the past. In its modern form, and with certain limitations to be referred to later, it is both tenable and credible; in this sense it can be properly termed a theory of the present. Still, when reference is made to the maternal impression theory in teratogenesis, probably there is scarcely any one who thinks, of it in any sense save in that old and extravagant one which demands belief in an absolute similarity between the thing producing the impression and the defect or anomaly resulting therefrom. In its generally accepted and classic sense, therefore, the hypothesis is of the past; but, like others of these ancient doctrines, it has its less widely known but vastly more reasonable modern development. In accordance with these circumstances, it has been placed with the theories of the past, but in juxtaposition with those of the present.

As will be made abundantly evident when the history of the belief in maternal impressions comes under consideration, the notion is one of great antiquity; but it may here be pointed out that it is also one of practically world-wide distribution. Ploss[1] has succeeded in gathering together indications of its existence in such far apart lands as India, China, South America, Western Asia, and East Africa; and I have elsewhere[2] quoted from various works to show that maternal impressions are not unknown among the Esquimaux, the Loango negroes, and the old Japanese. It is also, of course, the common possession of the nations of Europe. In fact, it may safely be postulated that the belief in the potency

[1] Ploss, H., *Das Weib.*, 2nd edit., i. p. 505, Leipzig, 1887.
[2] Ballantyne, J. W., *The Diseases of the Fœtus*, i. pp. 30, 31, and 41, 1892.

of maternal impressions has a geographical distribution corresponding with that of the human race, whilst in the matter of antiquity it is coeval with it.

It will now be well to trace so far as is possible the origin and growth of this ancient and well-nigh universal doctrine. In this way it will be learned that in its earliest beginnings it was not specially a teratogenic theory, but rather one used to explain how the young of men and of animals came to be of special colours, and especially of a tint differing from that of their parents; then it was accepted as the solution of the origin of mother's marks or nævi; then as a possible explanation of the birth of infants with hypertrichosis; and, finally, it came to be applied, and in most ingenious ways, to account for almost every kind of anomaly, malformation, and monstrosity. The story will be found to be one of no little interest, at times possibly also entertaining and even amusing.

Among the Hebrews.

Writers of all ages have commenced the history of maternal impressions with a reference to the patriarch Jacob and his triple artifice, by means of which he acquired a large number of speckled cattle of a vigorous breed. The sacred narrative tells[1] how Jacob first placed "rods of fresh poplar, and of the almond, and of the plane-tree," in which he had "peeled white strakes," before the flocks when they conceived at the water-troughs, "and the flocks brought forth ring-straked, speckled, and spotted"; having thus obtained some parti-coloured lambs, he put them (instead of the rods) before the flocks, and thus increased the number of such animals still more; and, finally, in order to get as vigorous as possible a breed of the parti-coloured, he put the peeled rods before only the stronger of the flock. "And the man increased exceedingly, and had much cattle, and maid-servants, and men-servants, and camels, and asses." From this it may be learned that Jacob was an expert stock-raiser well versed in all the notions of the age, which included a belief in the efficacy of maternal impressions upon the offspring at the time of conception. To attempt, as many have done, to use the narrative as a proof of the correctness of this ancient theory is manifestly unfair, for throughout the whole passage there is the thinly-veiled suggestion of an overruling Providence acting favourably to Jacob's plans.

In Ancient Greece.

Traces of this belief are also to be found in certain of the Greek writers, and Plutarch[2] states that Empedocles had remarked that

[1] Genesis, chap. xxx., verse 32 to end. The quotations are from the Authorised and Revised Versions; in the Septuagint it is not nearly so clearly expressed.

[2] Plutarch, *De placitis philos.*, lib. v., c. 12. Cited by Fienus (T.) in his *De viribus imaginationis*, p. 217, Lugd. Batav., 1635.

women gave birth to infants resembling the statues which they had found pleasure in regarding during pregnancy. Allusions to the effect of pictures and statues seen by women at the time of conception or during gestation are to be found also in the law of Lycurgus, which required the Spartan wives to look upon the representations of the strong and beautiful, *e.g.*, statues of Castor and Pollux; and in the story of Dionysius of Syracuse, who hung the picture of Jason in full view of his pregnant spouse (T. Fienus, *loc. cit.*). There is, however, no absolute proof that Hippocrates shared in these beliefs, for the story which St Jerome and others tell concerning the use he made of this notion in the defence of a woman accused of adultery is not to be found in the Hippocratic writings.[1] Further, the statement that "if a pregnant woman has a longing to eat earth and coals, and eats of them, the infant which is born, carries on its head the mark of these things," occurs in the treatise *De Superfœtatione*, which practically all commentators regard as not the work of the Father of Medicine himself.

Among the Romans.

The following quotation from Pliny's *Natural History* (Holland's translation, p. 161) demonstrates that among the Romans a belief in the efficacy of both the maternal and the paternal mind in the moulding of the fœtus was prevalent. The writer speaks of the black child of a white mother, and then goes on to say:—"Certes the cogitations and discourses of the mind make much for these similitudes and resemblances whereof wee speake: and so likewise many other accidents and occurrent objects, are thought to bee very strong and effectual therein, whether they come by sight, hearing, and calling to remembrance; or imaginations onely received, and deeply apprehended in the very act of generation, or the instant of conception. The wandering cogitation also and quicke spirit either of father or mother, flying too and fro all on a suddaine, from one thing to another, at the same time, is supposed to bee one cause of this impression, that maketh either the foresaid uniforme likenesse, or confusion and varietie." For this reason Pliny thinks that men are more unlike one another than other creatures: "For the nimble motions of the spirit, the quicke thoughts, the agilitie of the mind, the varietie of discourse in our wits, imprinteth diverse formes, and many markes of sundrie cogitations; whereas the imaginate facultie of other living creatures is unmoveable, and alwaies continueth in one, in all it is alike, and the same still in everyone, which causeth them alwaies to engender like to themselves, each one in their severall kind."

Galen,[2] also, believed in the power of the maternal imagination

[1] Ballantyne (J. W.), "Ante-natal Pathology and Heredity in the Hippocratic Writings," *Teratologia*, ii. p. 279, 1895.

[2] Galenus, *De theriaca ad Pisonem liber*, c. xi.

when influenced by pictures, etc.; and Soranus of Ephesus[1] spoke of the ape-like children which were born to women who had looked at monkeys at the time of conception. Oppian,[2] in his *Cynegeticon*, gave some interesting details concerning the application of the belief in the breeding of horses and doves of particular colours. Such statements, however, were not confined to what may be called the scientific literature of the age; for in the well-known romance of Heliodorus,[3] the belief is adduced to explain the colour of Chariclea, the white daughter of the black king and queen of Ethiopia, the queen having regarded a statue of Andromeda at the time of impregnation. It may be mentioned that Quintilian, in his *Institutiones Oratoricæ*, referred to a similar tale, only in this instance the parents were white and the infant black, and the cause was the picture of a Moor.

Among the Jews and Early Christians.

In the Talmud,[4] also, such stories are repeated, and there is an indication of a belief in the potency of impressions made in pregnancy *after* conception. The early Fathers of the Christian Church held similar opinions. St Jerome thought there was nothing strange in the infant bearing the impress of things seen or imagined at the moment of conception; and St Augustine, in his *Quæstiones in Genesim*, referred to the Biblical narrative of Jacob and his parti-coloured lambs.

In the Middle Ages.

Between the fifth and the fifteenth centuries little is recorded of the belief in maternal impressions, although it cannot be doubted that it existed. It would seem that Marcus Damascenus gave origin to the oft-repeated tale of the birth of a hirsute infant consequent upon the mother regarding the picture of John the Baptist in his hairy garment. St Isidore, also, seems to have warned women against looking at monkeys, cynocephali, etc., during pregnancy. The Arabian physicians had little to say on the subject, but Avicenna laid stress upon the belief that infants resembled in colour, etc., the things seen by the parents at the time of conception; and gave credence to the ridiculous story of a hen sitting upon her eggs being frightened by a kite, with the result that the chicks had heads like falcons.

From what has been said it will have been gathered that prior to the fifteenth century the notion of maternal impressions was a

[1] Soranus, Περὶ γυναικείων πάθων, c. x.
[2] Oppian, Κυνεγετικών, lib. i., v. 358.
[3] Heliodorus, *Æthiopica*, lib. iv., c. x.
[4] For Talmudic references, *vide* Preuss (J.), "Von Versehen der Schwangeren," *Berlin. klinik*, Heft 51, 1892.

well-established one; but it is noteworthy that it does not seem to have been much employed to explain monstrosities, unless indeed we regard the abnormal colour of the skin, nævi, and hypertrichosis as teratological. Further, its efficacy, save at the moment of conception, was not widely recognised; indeed, there is only slight evidence to prove that it was ever supposed to be active in later pregnancy. Its existence, however, was admitted both in the human species and in some of the lower animals, and we read over and over again of the great influence of pictures and statues. The mental impression seems most often to have been one of admiration; rarely is the idea of fear or disgust hinted at.

With the Revival of Learning in Europe came a great extension of the doctrine of the influence of the maternal fancy (phantasia), or, as it was often called, "imaginatio gravidarum," "Einbildungskraft," and (more popularly) "Versehen."

In the Sixteenth Century.

In a work on the "imagination," by Francisco Pico of Mirandola,[1] published in the early years of the sixteenth century, no mention is made of any peculiar properties of the fancy in pregnant women; and Taruffi (*Storia della Teratologia*, i. p. 231, 1881) is of opinion that the omission indicated that the author discredited the belief, not that he was unaware of it. Whether this be so or not, Martin Luther, in his work on Genesis, regarded the notion as a "res certa et conveniens cum doctrina medicorum"; he also told a story about a pregnant woman who was frightened by a mouse. Lycosthenes[2] indicated the popular belief when he related how in the year 1282 an infant was born with hair and claws like a bear, and how the Pope of the time straightway ordered the destruction of all pictures of bears in Rome. The child belonged to the well-known family of the Ursini. It may be noted that this story was frequently repeated by subsequent writers, who, however, did not all see in it an instance of such an innocent cause as the mother's imagination. Both Cardan[3] and Porta[4] were firm believers in the theory that if a pregnant woman longed for anything and touched a part of her body the fœtus would show a mark of the thing desired on the part corresponding to that touched by the mother (*chirapsy*). They also ventured an explanation to the effect that the spirit of the mother is united with that of the infant, and the heat, which is the instrument of the spirit, moves the blood (which is at once disturbed by the desire of the

[1] Francisco Pico of Mirandola, *Liber de imaginatione*, Venetiis, 1505.

[2] Lycosthenes (Conrad), *Prodigiorum ac Ostentorum Chronicon*, p. 445, Basileæ, 1557.

[3] Cardanus (J.), *Opera omnia*, De Sanitate tuenda, lib. i., c. 9, Lugduni, 1663.

[4] Porta (G. B.), *Magiæ naturæ*, etc., lib. ii., c. 23, Neapoli, 1558.

mother) into the corresponding part in the fœtus. Luiz Mercado,[1] a Spaniard, had another theory of the *modus operandi*, for he thought that the imagination disturbed the action of the semen of one of the parents, and so led to the mark on the infant.

Lemnius,[2] in his interesting work, stated his preference for the doctrine of the maternal imagination over that of stellar influence; and Ambrose Paré,[3] in 1573, gave it as the fifth cause of monstrosities, mentioning the illustrative instances of black and hairy children already so often referred to. The latter writer also figured an infant with the face of a frog, which Bellanger, "a man of an acute wit," regarded as occasioned by the mother's holding a frog in her hand just before conception. Paré went on to say (I quote from Johnson's translation, p. 596):—"There are some who think the infant once formed in the Womb, which is done at the utmost within two and forty days after the conception, is in no danger of the Mother's imagination, neither of the seed of the Father which is cast into the Womb, because when it hath got a perfect figure it cannot be altered with any external form of things; which whether it be true or no, is not here to be inquired of: truly I think it best to keep the woman all the time she goeth with child, from the sight of such shapes and figures." Cautious Paré!

It is scarcely necessary to do more than mention some of the other references to maternal impressions found in the literature of the sixteenth century. Sebastian Munster,[4] for instance, tells how two women, one of them being pregnant, got their heads knocked together, and how in due time twins united by the vertices were born to one of them. J. Rueff[5] speaks of the grievous effects of terror induced by the sight of hares and other animals, and says—"Ex appetitu rursum et terroribus multi nascuntur, qui varias maculas et figuras corpori impressas habeant, puta, crinium, murium, variorum colorum, racemorum, flammarum, fructuum, rerumque aliarum." Jean Wier[6] and Cornelius Gemma,[7] and several others, participated in the popular belief, which even found its way into the non-medical literature of the time: witness the story of black parents and a white child in the twelfth canto of Tasso's "Jerusalem Delivered." This was indeed the age of the wonderful, and nothing seems to have been regarded as incredible. Profound indeed were the discussions regarding the cutting of a golden tooth

[1] Mercado (Mercatus) (L.), *De mulierum affectionibus*, etc., lib. iii., c. 7, Valladolid, 1579.

[2] Lemnius (L.), *De miraculis occultis naturæ*, lib. iv., c. 18, 1564.

[3] Paré (A.), *Des monstres*, Paris, 1573.

[4] Munster (S.), *Cosmographie universelle*, lib. iii., Paris, 1575.

[5] Rueff (J.), *De conceptu et generatione hominis*, etc., lib. v., c. 3, p. 46, Frankforti ad M., 1580.

[6] Wier (J.), *De præstigiis dæmonum*, lib. iv., c. 18, Basileæ, 1563.

[7] Gemma (C.), *Cosmocritica*, Antwerpiæ, 1575.

by an infant in Silesia, in which Horstius,[1] Ingolstetter,[2] and Ruland[3] took part; and in Weinrichius'[4] quaint work entitled *De ortu monstrorum commentarius*, we read at great length concerning "*το φαντασικον*" and its supposed effects, about "fœtus ranæ facies," about "infans facie cadaverosa," and so on.

In the Seventeenth Century.

In the succeeding century (the seventeenth) the belief in the teratogenic powers of maternal impressions reigned supreme. Scarcely a writer ventured to throw a doubt upon its accuracy, and the most far-fetched explanations of monstrosities and deformities were eagerly accepted by both the public and the profession. Credulity would indeed seem to have reached a maximum when it began to be asserted and believed that conception might occur through the imagination alone. Of course, little was at this time known of the physiology of generation and of intra-uterine life, else such assertions could scarcely have been entertained. Interesting instances illustrating this extraordinary development of the imagination theory were reported by Thomas Bartholin,[5] G. C. Petrus,[6] and E. S. Grass.[7] In the first of these we read how Magdalena of Auvermont gave birth to an infant although her husband had been absent from her for four years; and how the occurrence was explained by the fact that the lady had in her dreams imagined her husband to be present; and so the child (Emanuel) was conceived "sola imaginationis virtute." After matrons and medical men had given their evidence upon this matter, the Parliament of Grenoble in 1637 declared the child to be the legitimate son and heir of Hieronymus Augustus of Montleon, the husband of the aforesaid Magdalena.

Even in this credulous age, however, reports of cases like the above were rarities. Most authors were content to narrate how an already existing fœtus was altered; few had the courage to describe the creation of an embryo through the force of the imagination alone. Certain of the records of the time may here be briefly referred to.

In 1605 Riolan,[8] in connexion with a case of double fœtus,

[1] Horstius (J.), *De aureo dente maxillari pueri Silesii*, Lipsiæ, 1595.
[2] Ingolstetter (J.), *De aureo dente Silesii pueri*, Lipsiæ, 1596.
[3] Ruland (M.). *De dente aureo pueri Silesii*, Francof., 1597.
[4] Weinrichius (M.), *De ortu monstrorum commentarius*, c. 17, p. 158, Brealæ, 1595.
[5] Bartholin (T.), *Hist. anat. et med. rar.*, Cent. v. and vi., hist. lxi., p. 296, Hafniæ, 1661.
[6] Petrus (G. C.), Conceptio hermaphroditica seu androgynea, *Miscell. curios. phys.-med.*, Ann. II., obs. ciii., p. 303, Jenæ, 1671.
[7] Grass (E. S.), Conceptus prodigiosus, *Miscell. curios. phys.-med.*, Dec. II., Ann. X., obs. lvi., p. 102, Norimbergæ, 1692.
[8] Riolanus (J.), *De monstro nato Lutetiæ anno Domini* 1605, Disput. philos., Parisiis, 1605.

referred to the imagination theory, stating his preference for it over the competitive notion of Satanic influence; the birth of a child resembling a demon was not due to the activity of an incubus, but to the influence upon the mother of pictures of diabolic creatures. Doubtless the women of that day were, or ought to have been, glad to welcome this change in the teratogenic doctrines of the time, for the substitution of the maternal-fancy theory for that of Satanic or bestial intercourse rendered the birth of a malformed fœtus a misfortune, but not any longer a crime. Riolan also believed that while the imagination could alter the properties of the uterine contents, it could not change the species. Fienus [1] in his treatise on the powers of the imagination, devoted more than 150 pages to the discussion of maternal impressions and the various questions arising therefrom; but that he did much to clear up these matters can hardly be asserted. He related the story told by Philippus Meurs about the child with a mussel for a head, who nevertheless lived for eleven years, receiving liquid nourishment from a spoon into the gaping bivalve; of course the mother had longed for sea-mussels in her pregnancy. Concerning this extraordinary maid and her still more wonderful death (through the breaking of one of the shells), Fienus said "dico me non credere"; but he did not hesitate to accept many other marvellous tales.

Septalius [2] and Hildanus [3] also wrote upon maternal impressions; and Schenkius [4] and Bauhinus [5] frequently adduced them to account for various monstrosities. Licetus, [6] although holding more advanced views on ante-natal pathology, yet clung firmly to the theory of the mother's imagination in teratogenesis; but he restricted its power in certain directions, and did not believe that mutilated monstrosities and those showing excess of parts could be thus produced. He admitted the efficacy of the paternal imagination also (lib. ii., c. xlii.); but this could not be so powerful as the maternal, for the time of its action was limited to the venereal act.

It has been pointed out by Taruffi (*Storia della Teratologia*, i. p. 234) that Zacchia,[7] writing in 1621, had indicated weak points in the doctrine of the maternal imagination when he stated that if such things were true, then there would be no infants without marks, and some children would be spotted all over like

[1] Fienus (T.), *De viribus imaginationis tractatus*. Quæstiones xiii. to xxiii., Louvain, 1608.

[2] Septalius (L.), *De nævis*, Dordrechti, 1650.

[3] Fabricius de Hilden, *Observ. et cur. chirurg.*, Cent. iii., obs. 56, Francoforti, 1646.

[4] Schenkius (J. G.), *Monstrorum historia memorabilis*, Francofurti, 1609.

[5] Bauhinus (C.), *De hermaphroditorum monstrorumque partium natura*, 1614.

[6] Licetus (F.), *De monstrorum natura*, etc., lib. ii., c. ix., xi., xix., etc., Patavii, 1616.

[7] Zacchia (P), *Quæstiones medico-legales, in quibus*, etc., i., lib. vii., Romæ, 1621.

leopards; but these arguments seem to have fallen on deaf ears, a fate which also met Santorelli's[1] statement, made thirty years later, that monstrosities were borne by women who had experienced no impression whatever. Whilst, however, one is willing to give to these Italian observers credit for critical views regarding the popular theory of their time, it must be confessed that their notions found little or no support till many years had passed. The writers who immediately followed held an almost unquestioning faith in the potency of the mother's imagination; and reference may here be made to Aldrovandi's[2] work and to that of Stengelius,[3] in both of which the matter is dealt with. Of course these authors recognised not only this but many theories of teratogenesis.

Towards the close of the seventeenth century observations on the supposed results of the mother's fancy multiplied enormously. Thus Kerkring (1)[4] puts on record the birth of what was evidently an anencephalic fœtus, but whose appearance, taken in conjunction with the mother's history, led the midwives to call it a devil—"diabolum non hominem esse conclamitant mulierculæ." He also told of a woman whose occiput was fractured in her pregnancy; the infant's head had no occiput. Swammerdam (2) opened up new ground when he narrated how a clever woman counteracted her own impression: she saw a negro in her pregnancy, and to prevent her child being black she washed herself in warm water; the matter turned out well, for the infant (who, by the way, was born with teeth) was white save between the fingers and toes and in the grooves on the face, places which the mother in her washing had evidently neglected.

One of the most frequently quoted stories of maternal influence upon the fœtus *in utero* is that taken from Malebranche's work (3), in which it is stated that a pregnant woman after having seen a criminal broken on the wheel, gave birth to an idiot boy, whose limbs were fractured. He also wrote of a woman who from much gazing at a picture of St Pius was delivered of an infant closely resembling the saint. "'Tis what all Paris may have seen as well as I, since it has been for a long time preserved in spirits of wine." With regard to the first of these tales, Malebranche had no difficulty in explaining all the phenomena to his own satisfaction. "Children," said he (to quote from Blondel's translation), "see what their Mothers see, they hear the same Cries, they receive the same Impressions of the Objects, and are moved by the same Passions.

[1] Santorelli (A. da N.), *Antepraxis medica*, lib. ii., c. xiii., par. 35, Neapoli, 1651.

[2] Aldrovandi (U.), *Monstrorum historia*, p. 384, Bononiæ, 1642.

[3] Stengelius (G.), *De monstris et monstrosis quam mirabilis*, etc., p. 179, Ingolstadii, 1647.

[4] In order to avoid overloading the text, references from 1670 onwards are gathered together in one list and referred to by figures in brackets.

All the Blows given to the Malefactor did violently strike the Mother's Imagination, and, by a Counter-blow, the tender and soft Brain of the Child. The Fibres of the Child's Brain, not being able to resist the Torrent of the Spirits, were broken: That's the Reason why he came into the World without Understanding. The violent Course of the Mother's animal Spirits, went, with Force, from her Brains, to the several parts of her Body, which answered to the Parts of the Malefactor. 'Twas the same in the Child, but because the Bones of the Mother were capable to resist the Violence of the Spirits, they were not wounded. Perhaps she did not feel the least Pain; but this rapid Stream of the Spirits was capable to carry away the soft and tender Parts of the Bones of the Child." This sad result would have been avoided had the mother known and practised Malebranche's instructions—"si cette mère eut determiné le mouvement de ses esprits vers quelqu' autre partie de son corps en se chatouillant au ce force, son infant n'auroit point eu les os rompus."

Dolæus (17) attempted a more physiological explanation of the *modus operandi* of maternal impressions, and held that the image in the mind was involuntarily communicated to the animal spirits, which impressed it upon the fœtus by means of the nerves of the uterus. The movements of the heart and intestines proved that the animal spirits were capable of involuntary motion. This theory was accepted by other writers, among whom was Bandiera (21), who, however, by bringing in the paternal imagination, which, of course, can only act at the time of conception, rather stultified the notion, for there is no nervous connexion at that epoch.

The remaining contributions of this century may now be summarized. Bayle (9) dealt with the matter of maternal impressions, and regarded it as an endless task; Boyle[1] repeated a tale about a speckled child whose mother had (before pregnancy!) gazed long and earnestly at some red pebble-stones near St Winifred's Well,—and yet his mind also conceived Boyle's Law of the relation between volume and pressure!; Diemerbroeck (13) was so sure of the theory that he employed it in his scheme of heredity; and Fidelis (4) used it to explain why deformed parents had not always deformed children. In the pages of a periodical called *Zodiacus medico-gallicus* Nicolas de Blegny (10) and Cuchotius (12) recorded further instances of maternal impressions. Finally, the volumes of the *Miscellanea curiosa* are full of cases of fœtal monstrosities ascribed to the influence of the mother's mind and imagination. Amongst these may be mentioned the contributions of Ludovici (6), Segerus (7), Mercklinus (8), Sommerus (11), Albrecht (14), Fehrius (15), Göckelius (16), Hoffmannus (18), Lentilius (20), and Reiselius (22).

[1] Boyle (R.), *Exper. Philos.*, p. 151.

In the Eighteenth Century.

In the seventeenth century the attitude of the profession towards the doctrine of maternal impressions was one of blind credulity; but in the eighteenth this was quickly changed for one of sceptical criticism. Of course, there were still many who in the latter century believed in the efficacy of the mother's mind in moulding the unborn infant; but the prevailing opinion was one of grave doubt. It would have been strange indeed if this had not been so, for the discoveries of the close of the seventeenth century had done much to clear up many of the vexed questions of reproduction and antenatal physiology.

In the early years of the century, criticism was not yet rife. Düttel (24), for instance, in his work on fœtal diseases, clearly stated his views: "So great," said he,[1] "is the sympathy between mothers and the fœtuses which they carry in the uterus that they suffer closely with them, to such an extent that not only are the delicate fibrillæ of the infants excited to anomalous movements by every severe affection of the mind of the mother (*e.g.*, sorrow and anger), but, what is more, the formation of parts is altogether prevented, disturbed, or vitiated by the strong imagination of the mind." In the *Miscellanea curiosa* cases of maternal impression continued to be reported (23, 26, 35, 36, 38, 40, and 41); and in England Daniel Turner (28) stated very confidently his belief in such occurrences, for after enumerating most of the cases to which reference has been made above, he said: "Thus is it made apparent by a Multitude of Examples, how manifest and great an Empire the *Fantasy* of a pregnant Woman has over the Blood and Humours together with the Spirits of her Body, and how by their Ministry she is able to give not only monstrous Shapes and Figures to that of the more tender *Fœtus*, but to communicate Diseases also." He also related cases from his own practice of a raspberry mark near the eyebrow, of a currant-like excrescence on the internal canthus of the eye, etc. In the year 1726 the matter of maternal impressions was brought still more prominently before the profession and the public in England in connexion with the notorious case of an "Extraordinary Delivery of Rabbets," which was alleged to have occurred in the case of Maria Tofts of Godlyman (Godalming) in Surrey; she had had a great longing for "Rabbets" in early pregnancy. (Nos. 29, 30, 31, 32, and 33).

It is probable that the "Godlyman" case, in conjunction with the appearance of Turner's appreciation of the doctrine of maternal impressions, stirred up Blondel (34) to write his famous criticism thereupon; but already in the year 1712 Nigrisoli (27) of Ferrara had argued against the popular belief, and had pointed out that the fœtus was entirely separated from the mother, that monstro-

[1] Ballantyne (J. W.), "The First Monograph on Fœtal Diseases," *Teratologia*, i. p. 41, 1894.

sities occurred in animals in whom they could scarcely be ascribed to imagination, and that in the human subject deformities were met with for which no disturbing impression could be alleged. To Blondel (34), however, belongs the credit of dealing to the maternal impression theory the most deadly blow it had yet received. Very skilfully did this writer marshal his facts; and with no small degree of humour, and now and then some biting sarcasm, did he state his arguments and refute the assertions of those whom he delighted to dub the "imaginationists." In the first instance, his satire was specially directed against Mr Daniel Turner; but he did not spare other, older, and more widely-known exponents of the imagination theory. The first edition of Blondel's work (34) was published anonymously in 1727, at least on the title-page the author was simply described as "a member of the College of Physicians"; but in the second issue (37) of the book, in which were many additions and amplifications of the argument, the writer openly avowed himself, not "out of ostentation," as he said, but to show "that I dare face the enemy."

Blondel arranged his facts and arguments with intent to prove that the current theory was unsupported by experience, by reason, and by anatomy. With regard to experience, he showed that impressions often occurred which were not followed by marks or anomalies in the fœtus, and that deformities were met with in cases in which no impression was alleged. Further, he analysed in detail the exceptional cases in which it had been maintained that a definite impression had resulted in the production of a similar mark on the infant; and under such pithily descriptive epithets as "Parey's Frog," "Miss Muscle and the Grenadier," "the Baker bit," "Sir Kenelm Digby's Patch," etc., he subjected to much ridicule the illustrative instances gathered (mostly from Fienus) with great care and apparently with almost perfect faith by Daniel Turner. Having dismissed these, Blondel turned his attention to the story of Jacob and his rods, which curiously enough seems greatly to have exercised him. Most will agree that he was at altogether unnecessary pains to explain away this particular case. The author concluded that there "are so many odds against imagination that the cases related in its favour can never over-balance those which are against it," and in his opinion they "may be compared to an accidental hit of a dream or the predictions of a Fortune-teller, which, now and then, are accomplished."

Blondel, then, having "entirely beat the Imaginationists out of their Entrenchments of Experience," attempted to show that reason also was against the popular belief. Conception, the growth of the embryo, and the determination of its sex were all outside the power of the mother's will. "How," he said, "can anybody believe, without reflecting upon the Wisdom of God, that it is left to her to disfigure the child, and to spoil the regular Work of Nature?" Again, since the woman cannot by her imagination mark her own

body, it does not seem probable that she should be able to act thus on her fœtus. Other arguments were advanced, and then the writer pointed out that there exists no communication of nerves between the mother and fœtus, and so there could be no communication of thoughts, as alleged by Malebranche and others. In his efforts to absolutely extinguish any flickering flames of belief in the imagination theory, Blondel adopted the erroneous doctrine of the pre-existence of all the parts of the fœtus somewhere before conception. By what means, then, can the mother's imagination obliterate the lineaments of the fœtus, which were pre-existent to conception and subsisting ever since the creation of the world? Finally, anatomical reasons are adduced to show that there is no direct circulation of blood between mother and fœtus, and Blondel refers to the much more probable natural causes of fœtal marks, such as intra-uterine diseases or traumatism and heredity.

Blondel's work, which I have thus attempted to epitomize, produced a great effect upon medical opinion all over Europe, and soon numbered adherents in nearly every civilized country. In France, for instance, not only did translations of the English physician's work appear, but Bellet (48) also wrote a book to combat the popular belief in impressions. In Germany, also, Haller (56) to a large extent threw the weight of his authority into the scale against the popular theory; and, in Russia, Roederer (58) did likewise, though with less effect. In Scotland Alexander Monro (39), in his essays on the nutrition of fœtuses, showed clearly that he was an opponent of the maternal imagination theory, for he wrote (in 1734) as follows:—"The Liquors sent into the *Fœtus* by the umbilical Vein not having their propelling Force communicated from the Mother, the State of the Mother's Pulse cannot affect the Child otherwise than by occasioning Abortion, or vitiating the Fluids that are to be absorbed; and therefore we may be convinced, how vain it is to pretend to account in a physical Way for the Impressions said to be made on Children by the Imaginations of the Mothers." Monro's correct views on fœtal physiology along with their bearing on impressions seem, however, to have been overlooked by succeeding writers. Vari (62), in Italy, was at first a supporter of Blondel's position, but afterwards through a personal experience came to change his views. Plancus (55), another Italian, entirely sided with Blondel.

Whilst, however, the spirit of criticism was thus infused into the subject, there was still in the minds of many authorities a firm belief in the potency of maternal impressions as teratogenic factors. Superville (44), for instance, after relating how seven pigs taken from a freshly slaughtered sow all showed the bloody mark of the knife about their necks, proceeded to state his adherence to the theory of the influence of the "disturbed and disordered imagination of females." He referred to certain objections to the belief, and then said,—"I own I do not comprehend it neither. It

does not follow from thence, that we ought to reject as false all that our Reason cannot penetrate into." Gregory (45), writing soon after, seems to have had even less doubt, for he told how a pregnant woman "took prodigious notice" of a monkey with a hood turning on a stick, and how the fœtus *in utero* turned over and over in like manner (for were there not twists in the umbilical cord?), and when born was seen to resemble closely a hooded monkey. Nicolai (50) tried to refute Blondel's opinions; but (54) had to admit that monstrosities did not resemble the subjects of the impression.

It must also be borne in mind in estimating the influence of the writings of Blondel and his followers that on the Continent the great weight of Boerhaave's authority (49) had been in favour of the old theory, with certain reservations regarding the sort of impression and its mode of incidence. Boerhaave's commentator, Van Swieten (43), seems to have been much struck by the life-like representation of a caterpillar on the neck of a young girl whose mother had in her pregnancy been impressed by a real caterpillar crawling on her neck. Another defender of the imagination theory was Krause (59), whose dissertation obtained special honour at the Imperial Academy of Science in St Petersburg; he alleged the existence of a nervous communication between the mother's uterus, the placenta, and the fœtus, and had no difficulty in understanding how disturbances of the mother could deform the infant, especially since the organs of the latter were so tender.

Boerhaave, however, was not always so fortunate as to have a commentator willing to accept all his views on the subject of maternal impressions. Albert von Haller (66), in fact, did much to support Blondel's criticism, whilst he also established it on more scientific arguments. For instance, he maintained that if there existed a nervous communication between mother and fœtus, then the gathering together of the placental nerves in the umbilical cord would constitute so evident a strand of nerve tissue that no observer could possibly overlook it. If, again, the communication was a vascular one—and this might be admitted—how could images of things be transmitted by means of a column of liquid in a tube. The birth of twins of different colour was explicable in a more prosaic manner than by the invocation of the mother's imagination. Nævi, according to Haller, were due to skin disease, and monstrosities were the result of fœtal maladies. It does not appear that this author was altogether opposed to the doctrine of impressions, for he seems to have been struck by the fact that children resemble their parents, and to have regarded it as an argument in favour of the theory. Smellie (57), who lived about the same time, was, doubtless, sceptical also, for after noting two cases, he wrote: "Notwithstanding these examples, I have delivered many women of children who retained no marks, although the

mothers had been frightened and surprised by disagreeable objects, and were extremely apprehensive of such consequences."

Morgagni (63) was yet another well-known writer of this period who hesitated about throwing overboard the theory of impressions; he believed that while most cases in which a fœtal defect resembled a maternal impression were accidental coincidences, yet some contained another element which he freely confessed that he did not comprehend.

Between the years 1760 and 1780 it ought to be noted that several popular statements of the anti-imaginationist side of the matter were put before the British public in the form of "letters" or "essays" from anonymous authors, addressed to "the ladies" or to "a married lady" (*vide* Nos. 64, 65, and 71). In these works the arguments used by the writers to convince their fair readers are often interesting and even amusing. In one (65), published in 1765, the author says, "a mark which has been foretold has once in 1000 times happened to answer its description; another effect of chance, which may serve to support the prejudice of those who do not reason, but can have no influence on those who, like you, madam, are only convinced by truth." Another author (71), writing in 1772, sums up as follows: "The same chain of ideas, that shows the impropriety of believing the cure of a toothache by a charm; the destruction of warts by turning thief, and stealing raw meat; the cure of the cramp by wearing rosemary, or placing the soals of our shoes uppermost when we go to bed: I say, the same chain of ideas that shows the impropriety of believing these absurdities, will, when applied with a real desire to be informed, whether the imagination in pregnant women possesses the powers ascribed, convince the enquirer that the tales told of the mother's imagination exerted on the fœtus, are a collection of falsities formed by superstition and ignorance, and continued by prejudice and credulity."

The last years of the eighteenth century did little to settle the question of the potency of the mother's imagination on the fœtal form. We find, in fact, that the minds of the writers of the time were greatly exercised with the side question—a theological one—concerning the result which an acceptance of the imagination theory would have upon the idea formed of the Creator of the Universe. To the discussion of this matter Rickmann (70), Arnold (72), Engelhardt (82), and others devoted themselves; but into their arguments it is unnecessary to enter. Other writers, some for and some against the popular theory, were Eller (68), Kooy (69), Schönwald (73), Schenk (74), Jeunet (75), Bablot (77), Hoffmann (78), Fielitz (79), and Schumann (80); but the enumeration of their names must suffice for the purposes of this sketch.

It may be of interest to the curious to know that near the close of the eighteenth century the money value of a maternal impression (of a patriotic kind) was fixed at 400 francs per annum; for

Geoffroy Saint-Hilaire (*Histoire des Anomalies*, i. p. 332, 1832) records that in the third year of the French Republic an infant was born with the representation of a Phrygian cap of liberty on the left breast, and to the mother the Government awarded the above sum, presumably for patriotism!

In the Nineteenth Century.

The nineteenth century opened with the question of maternal impressions still unsolved. Medical opinion took one of three lines: complete belief in the potency of a mother's imagination to mark her fœtus in exact resemblance with the object acting upon her mind; or complete disbelief in any such power; or an intermediate line of partial acceptance of the doctrine of maternal mental influence over the infant,—an attempt to reconcile the traditional belief with the spirit of modern scientific inquiry.

It now became increasingly difficult for the trained physician to accept the old doctrine, for the reseaches of the eighteenth century had demonstrated that there was no direct communication between the circulatory system of the mother and that of her fœtus, and in the early part of the nineteenth it became evident that no demonstration of a structural nervous union could be given. On the other hand, the effect of these anatomical discoveries concerning the connexion between mother and unborn infant was to some degree discounted by the enunciation of animal magnetism by Mesmer, and its partial acceptance by the medical profession; for if its tenets were correct, there was no longer any need for the demonstration of nerves in the umbilical cord.

In the first year of the century Desgranges (84) published his communication in support of the maternal imagination theory, specially in reference to nævi materni, and he has been followed by a long series of writers, some favourable, some inimical, to the doctrine. Besides the authors who have made special contributions to this subject, nearly every one who has written on midwifery, surgery, diseases of children, and dermatology, has ranged himself amongst the believers, the unbelievers, or the neutrals. An enormous literature has, therefore, gathered around the question of the mother and her influence upon her unborn child, and it becomes impossible to do more than point out certain of the more important articles which have dealt with the matter.

If we consider first what the teratologists of the nineteenth century have said on the subject, we shall find a very marked leaning towards the total condemnation of the theory of maternal impressions. Jens Bang (86), it is true, supported the old doctrine, and Jouard (90) took up an intermediate position; but nearly every one else has showed great scepticism, some even passing the subject over in complete silence. Tiedemann (97), in

his work on acephalic fœtuses, pointed out that only in one case was an impression recorded; further, he insisted that the fact that one twin was commonly normal whilst the other was so deformed was a strong argument against the theory; and, finally, he propounded the question, What imagination of the mother could be at work to produce in the infant a one-horned uterus or an intestinal diverticulum? Zimmer (89) and Clesius (94) also opposed the imagination theory, and Herholdt (113) entered at great length into its history. We find Etienne G. Saint-Hilaire (111) taking an intermediate position, whilst he pointed out that prolonged moral impressions could have little or no teratogenic effect, as shown by the very small number of monstrosities born in such a large city as Paris. He also noted three cases in which a sudden and sharp impression was the cause of anencephaly, not through the imagination alone, but on account of the sudden uterine contraction thereby produced, and the consequent pressure on the ovum or embryo. He thought that prolonged emotions might weaken the fœtus without making it actually monstrous. Isidore G. Saint-Hilaire (124) adopted largely the views of his father in this matter; but he more clearly defined the sphere of action of an impression. Violent and sudden impressions may cause monstrosities in the manner above indicated; moderate or feeble, but long-continued impressions may also, it cannot be denied, produce malformed and even monstrous infants; but it cannot be believed that slight and transient desires, feelings of disgust or of fear, etc., have any influence upon the form of the unborn infant. "Il est surtout contraire à toutes les données de la science et de la raison, de croire qu'un objet vu, craint ou désiré par la mère, puisse venir, pour ainsi dire, se peindre sur le corps de l'enfant qu'elle porte dans son sein; et la saine physiologie ne peut voir dans cette ancienne croyance qu'un préjugé aussi absurde, et quelquefois aussi dangereux qu'il est ancien."

Vrolik, another well-known teratologist, was more clearly an unbeliever than were the Saint-Hilaires, for he admitted nothing further than that a nutritive disturbance in the mother following a severe shock might lead to a defective development of the fœtus. Förster (201) enumerated eight arguments against the impression theory, including the statement that most malformations develop in the first month, nay, even in the first week of pregnancy, and therefore at a time when the mother commonly does not know that she is pregnant. He also noted that impressions were common while monstrosities were rare, that there was no direct nervous communication between mother and fœtus, and that one twin might be normal and the other malformed. Wonderful stories impressed Förster not at all: "die Literatur ist voll von solchen Fällen, noch mehr aber die Köpfe der Hebammen und alten Weiber weiblichen und männlichen Geschlechtes."

Of the more recent teratologists nearly all have treated the

subject of the influence of the maternal imagination as a silly fable; and in the works of Ahlfeld and Hirst and Piersol there is no reference to it, whilst in those of Taruffi, Guinard, and Blanc it is simply considered from a historical standpoint. E. Martin (259), alone, has argued in favour of a modified form of the old belief. He has stated that imagination plays an undoubted part in the procreation of monstrous forms; but he has also insisted that this part is a mechanical one,—that through the nervous system the uterus is thrown into contraction, and thus undue pressure is brought to bear on the embryo. The occasional occurrence of fœtal malformations which resemble the objects causing the maternal nervous disturbance is purely coincidental. Martin seems also to regard the mother's mental state during pregnancy as in some degree modified so as to be more susceptible to impressions.

Alongside of this almost total abandonment of the imagination theory by the teratologists of the nineteenth century, we have to place the extraordinary rejuvenation of the ancient doctrine among the leaders of the medical profession in the United States of America. Between 1839 (the year in which the report of the "Snake-man," Robert H. Copeland, whose mother, when pregnant, had been struck by a rattlesnake, appeared) and the present time papers dealing with maternal impressions, to the number of 143, have been published in American journals. Not only have the contributions been many, but they have also, with few exceptions, been favourable to the imagination theory. Further, amongst those who have most warmly supported the old doctrine were such acute thinkers and weighty authorities as Fordyce Barker (294), Samuel C. Busey (295), and William Goodell (216). Fordyce Barker thought "that the weight of authority must be conceded to be in favour of the doctrine that maternal impressions may affect the development, form, and character of the fœtus," and even went so far as to believe that "these causes may act effectively on the ovules before fecundation," alleging in proof the famous "Dundreary Case." Barker also included telegony, or the influence of a previous sire, in the sphere of maternal impressions, a question with which J. Brunton Blaikie has recently dealt (*Teratologia*, ii. 170, 1895). Goodell was, "to a certain extent," converted from a sceptic into a believer by a case of pre-natal circumcision which occurred in his own practice.

It must not, however, be thought that the theory of maternal impressions was unanimously accepted by the profession in the States. On the contrary, J. G. Fisher (213) wrote at length against the popular opinion, but did not add any novel arguments; and Dugas (202), Norman Bridge (223), and Conant (199) were all strong in their opposition. Still, it is evident that at the present time the theory is held strongly by a great many medical men of note on the other side of the Atlantic; for Hubert Work (369),

writing as recently as October 1894, was able to report that out of thirteen physicians (including Penrose, Goodell, Matthew D. Mann, Hatfield, Cooke Hirst, W. A. Edwards, and A. T. King) whose opinion he asked, only one (Hatfield) was emphatic in his disbelief of the statement that "pronounced impressions made upon the mind of a pregnant woman predispose to bodily defects and birth-marks in the child."

The trend of opinion in America is also learned from the study of Dabney's contribution (317) to Keating's *Cyclopædia of the Diseases of Children*, and Edward P. Davis' to Norris' *Text-book of Obstetrics* (p. 213, 1896). Finally, to quote from popular literature, Oliver Wendell Holmes had not a little to say about the result of an "impression" in his fascinating novel *Elsie Venner*. This is by no means the only instance of the belief entering into the fiction of past and present times; for allusions to it are found in Shakespeare's *Merchant of Venice* (Act I., Sc. 3), Scott's *Fortunes of Nigel*, and Sterne's *Tristram Shandy*, while from a casual survey of modern literature I have noted references thereto in Blackmore's *Lorna Doone*, in Henty's *Rujub the Juggler*, in Merriman's *From one Generation to another*, in Egerton's *Keynotes*, and in Cobban's *Red Sultan*.

Whilst the teratologists of this century have practically abandoned the imagination theory, and whilst American writers have in large degree resuscitated the doctrine, surgeons, obstetricians, physiologists, and dermatologists in Europe have held very various opinions thereupon. In Germany, for instance, in the first half of the century there were many who wrote on the power of maternal impressions, among whom were Harting (88), Merle (92), Klein (99), Gittermann (103), Hirsch (104), Wesener (105), Schneider (108, 115, 118), Keyler (120), Braun (123), Späth (125), Kœhler (135), Pauli (136), Rubner (137), Solbrig (143), Droste (153), Hoffmann (154), Straube (157), and Leopold (162). All did not support the old belief; but many did so, and some even went to ridiculous lengths, such as to affirm that the infant's feet were deformed by the mother wearing tight shoes in her pregnancy (108), and to say that the sight by a woman of a one-armed man at the eighth month of her pregnancy could cause the birth of a fœtus with one arm wanting. Others, such as Jörg (96) and Meissner (109), argued against the theory, the latter bringing forward some strong clinical evidence. J. Müller (139), the physiologist, also, was a strong opponent of the theory; but Burdach (128), another physiologist, supported it, and thought that the relation between mother and fœtus was an occult one, like animal magnetism. In the second half of this century a comparatively small number of German writers have specially written on the subject (including Brach (164), Wagner (166), Ritter (168), van Praag (170), Tassius (172), Willige (175), Adler (176), Santlus (182), Heidelberg (184), Upmann (189), Clemens (190),

Roth (288), Wolff (348), Preuss (356), and the text-book writers); but save in the period 1850 to 1860 the general feeling has been strongly opposed to the ancient doctrine.

In France and Belgium the general trend of opinion during the last hundred years has been much the same as in Germany. Amongst the special writers on the subject must be named Desgranges (84), Martin (85), Clarae-Faget (91), Girard (98), Levêque-Lasource (100), Demangeon (114), Bérard (121), Burggraeve (141), Steinbrenner (144), Guislain (146), Schoenfeld (147), Pigeolet (152), van Camp (159), Bayard (163), Turck (177), Schrevens (217), Liebrecht (232), Loin (255), Liégey (258), Mijnlieff (333), Delassus (337), and Variot (346). Burggraeve (141) attempted to give a more scientific aspect to the old theory by combining it with the known facts of embryology: he related how a woman at the third month of pregnancy saw a pig with its throat cut, and feared that her infant might be affected; the child showed a cleft in the throat which the author regarded as due to the want of union of the branchial arches which were separate at the time of the impression. Guislain (146) reported (amongst others) a curious case of aural deformity following a "longing," and Bourgeois (195) concluded that "les impressions profondes ou vivaces de l'imagination occasionnent quelquefois chez l'enfant des vices de conformation." In 1876 Liebrecht (232) wrote in support of the theory of impressions; and as recently as 1891 Delassus (237) related two cases (one of hare-lip and one of anencephaly) which seemed to have confirmed him in his belief in the old doctrine.

In Italy, also, the power of the imagination of the mother in teratogenesis has found defenders and opponents and critics, to some of whom Taruffi (*Storia della Teratologia*, i. p. 242) refers. For instance, Monteggia (87) put on record a case of intra-uterine amputation alleged to be due to the mother seeing many cases of amputations; Barbieri argued against the belief, and suggested more natural explanations of fœtal states, and Vannoni (162*a*) hinted that possibly a predisposing condition was needed in mother and fœtus before an impression could become efficient. Fenoglio (106), Viparelli (149), and others contributed further to the literature of the subject in Italy. In Poland, Neugebauer was a believer, as Drzewiecki (339) tells us.

With regard to Great Britain, it would seem that the influence of Blondel (37), Munro (39), and Smellie (57) has been largely effective in preventing a wide acceptance of the imagination theory in the ranks of the profession. Alleged cases have from time to time appeared in the *Lancet* (*e.g.*, those reported by Hoare (116), Canton (129), Rankin (130), Wansbrough (132), O'Shea (155), Dunn (156), Beale (192 and 198), Child (206), Daly (209), and others); the *British Medical Journal* (*e.g.*, those by Curran (203), Houghton (204), Graham (207), Thompson (222), Clapper-

ton (224), Huntley (225), R. J. Lee (226), Sandham (228), Jenkyns (372), Jones (373), and others); the *Medical Times*, the *Dublin Medical Press* (*e.g.*, 140), and the *Glasgow Medical Journal* (*e.g.*, 353); but although these contributions have been fairly numerous, the feeling amongst obstetrical teachers has been inimical to the notion of maternal influence. Ryan (119), for instance, was strongly opposed to it, and so have been many others. Montgomery (182*a*) was an exception, for he wrote, "I cannot help thinking it quite consistent with reason and the present state of our knowledge to believe that a very powerful impression on the mother's mind or nervous system may injuriously affect the fœtus, still lodged in her womb, actually a part of herself, and deriving its supply of life from her blood; and this, the more especially, as many instances have been witnessed in which the child *after birth* has suffered seriously by being suckled by a woman labouring under some strong mental impression."

The matter was brought up by myself on two occasions (335, 349) at meetings of the Edinburgh Obstetrical Society, with the general result that no decisive proof for or against was forthcoming, and that the question was still to be regarded as *sub judice*. Barnes is content to leave the problem unsolved; but Ashburton Thompson (248) would seem to have been a believer. Much more might be said concerning British contributions to this vexed question, but it must suffice to note that Everard Home (110) was a supporter of the doctrine, and that Arthur Mitchell (290) may be said to have demonstrated the potency of mental emotion in the causation of idiocy.

Such is, in outline, the history of this teratogenetic theory, extraordinary alike whether its truth be affirmed or denied; wonderful alike in its wide extension in space and time, and its firm hold upon the minds of both profession and laity. To those who wish to see it dead it is most disappointingly vital, to those who wish to demonstrate its truth most strikingly destitute of scientific proof. In its support is a marvellous mass of evidence of the *post hoc ergo propter hoc* kind; arrayed against it are the scientific theories of biology which have been gradually and laboriously built up by the savants of this and of other ages.

From the standpoint of the student of antenatal pathology the theory of maternal impressions must be regarded as a great misfortune. Many instructive cases of fœtal disease and deformity have been practically lost to science through the absorption of the observer's mind in ideas of the mental process in the mother which could have caused the state of her infant, and through his desire to trace in the morbid fœtal condition a resemblance, often far-fetched indeed, to some animal, vegetable, or mineral. In this sense the theory has been the grave in which a great deal of fœtal pathology has been buried; for instead of a case being entitled one

of anencephaly, or of fœtal ichthyosis, or of hirsuties or hairy nævus, it has been simply labelled "a curious instance of maternal impressions," "a striking case of the influence of the mother's mind on the fœtus," etc. Further, the material thus hidden away is in most cases permanently lost; for a reference to the report usually gives us no anatomical or pathological details to enable us to identify the malady or the malformation, but simply tells us that the infant had a head like a cat or a rat, or was hairy like a bear, or had scales like an alligator or a snake.

The theory has had a maleficent effect on the progress of the study of antenatal pathology. Of that there can be no doubt. But the question whether there is or is not any truth in the theory still remains to be settled. In the historical sketch which has been given I have indicated most of the arguments which the supporters and the opponents of the doctrine have adduced; these I need not again refer to, but may simply state briefly what I regard as the correct view to take of "maternal impressions." In order to centralize our knowledge on the subject, I may ask myself two questions:—(1.) Does a definite impression upon a pregnant woman's mind often or ever cause a defect in the fœtus closely resembling the thing producing the impression? and (2.) Has the state of the mother's mind during gestation any effect upon her unborn infant's development?

The first question I answer in the negative, and the second affirmatively. Since I wrote upon the subject some years ago I have very carefully examined the evidence upon which several alleged cases have been founded, I have had opportunities of attending confinements in which all the elements regarded as suitable for the production of the results of an impression were present and in which the children were free from anything at all resembling the impression, and I have very fully acquainted myself with the voluminous literature of the subject. The conclusion drawn is that the cases which have been advanced to prove the potency of maternal impressions have been accidental coincidences, and not the effects of the alleged causes. Their great number may be adduced to prove that the doctrine must contain an element of truth; but it has to be pointed out that, numerous as they are, the cases in which nothing of the kind happened are vastly more numerous. Further, although I do not wish to lay too much stress upon this, no adequate scientific explanation of the *modus operandi* of such impressions has ever been advanced. Whilst I am willing to admit that the mother's nervous system is often in a peculiar state during pregnancy, and whilst I fully recognise the possibility of the mother affecting the fœtus with a disease, and *vice versa*, I regard it as impossible for (*e.g.*) the sight of a mutilated individual to be so transmitted mentally by the mother as to cause a fœtal amputation resulting in a similar deformity in utero. At the same time,

I must concede that perhaps one case in a hundred presents phenomena which it is very difficult entirely to explain away. One such case I have myself met with; but it seemed to me reasonable enough to think that a more rational explanation of it existed, although as yet unknown, than the influence of the mother's imagination.

With regard to the second question, I think there can be no doubt that prolonged or strongly-marked mental states of the mother may affect the development of the fœtus in her uterus. That such can produce abortion none, I fancy, will deny; and that short of producing miscarriage they can also lead, through vascular and nutritive disturbances, to irregularities in embryogenesis is eminently probable. In Paris, it is said, the children that were conceived during the disastrous siege of the Franco-Prussian war can be recognised by bodily and mental stigmata so marked that they have been dubbed "enfants du siège." In reference to this phenomenon Féré (369*a*) says "les enfants qui ont été conçus et portés à certaines époques troublées offrent en grand nombre des troubles de nutrition, des malformations et en particulier des altérations des fonctions du système nerveux." Of course it must be admitted that the poor or bad food and the defective hygiene of such seasons were also operative, still it is reasonable to believe that in part the results were due to the continued and severe terror and constant anxiety incident to a time of siege in modern warfare. In the same way the results are not always teratological, but may, as Féré has also shown (377), be of the nature of sterility, abortion, premature labour, mortinatality, congenital debility, and retarded growth and development. There are then many causes at work and many resulting phenomena; but amongst the former it is fair to reckon mental emotion, and among the latter monstrosities. To this extent I believe in the old doctrine of maternal impressions; this is, I think, the one grain of truth in an immense mass of fiction and accidental coincidence. The conclusion is also in accordance with the results of experimental teratogeny.

Note.—In order that more light may be thrown upon this matter, cases in which mental impressions in pregnancy were followed by the birth of infants *in any way abnormal* ought to be put on record. For instance, a woman, pregnant four or five weeks, was greatly impressed by the sight of a child with a hare-lip; at the full time all her friends came together to see an infant born similarly affected, but the offspring showed not a hare-lip but a large nævus on the neck (Féré, "Un fait pour servir à l'histoire des bouffées de chaleur et des rougeurs morbides," *Compt. rend. Soc. de biol.*, Oct. 1894). It is by no means certain that this was an instance of cause and effect, but such cases are far worthier of record than are those in which an impression is said to reproduce itself, as regards form and situation, on the infant's body.

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MEETING IX.—JULY 8, 1896.

DR A. BALLANTYNE, *President, in the Chair.*

Dr Marshall, Glasgow, showed a small TUBAL GESTATION removed before rupture.

A discussion on "Professional Secrecy *versus* Privilege in Obstetrics and Gynæcology" was opened by Professor Simpson and Dr Halliday Croom, and taken part in by Drs Hart, Underhill, Spence, Buist, Barbour, J. Ritchie, Rattray, Batty Tuke, Elder, Marshall, Milne Murray, and Mr Taylor Innes.

The Society thereafter dined together.

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GENERAL INDEX

TO THE

TRANSACTIONS OF THE EDINBURGH OBSTETRICAL SOCIETY

FOR

VOLS. I. TO XXI.,

SESSIONS XXVIII. to LVII.,

1868-9 TO 1895-6.

PREPARED BY

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PREFATORY NOTE.

PREVIOUS to the publication of Vol. I. of the Society's Transactions, the papers read before its Meetings appeared in the medical journals of the time, along with occasional reports of the discussions which then took place, and of the specimens and patients shown by the Fellows. At the end of Vol. I. will be found a simple list of these communications compiled from the Minutes of the Society by Dr Peel Ritchie. The present Index, which has been prepared without reference to the annual indexes in the individual volumes, contains the record of the Society's work up to date. It consists of two parts,—an Index of Subjects and an Index of Authors; this arrangement will, it is hoped, facilitate reference.

Since some of the early volumes contain the records of more than one session, a table is appended showing the session or sessions included in each volume. Further, it must be noted that up to Vol. VIII. there was an error in the numbering of the sessions, as was pointed out by Prof. A. R. Simpson in his Valedictory Address (Vol. IX. p. 3); this explains the apparent anomaly in the sessional numbering.

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The pagination of Vol. V. offers an exception to the general rule, for it consists of three parts, each of which is paged separately, hence references to the volume take notice of this fact; thus, "Abortion at ninth week (A. R. Simpson), v. (i.) 91" refers to Vol. V., Part I., page 91.

Several important clinical observations buried in the Maternity Reports have been indexed and so brought to light again; and this remark applies also to a few papers in which several different conditions have been described under a common (or vague) title. It is to be regretted that in some few instances only the titles of articles have appeared in the Transactions; this fact is taken notice of in the Index.

J. W. BALLANTYNE.

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* *Quadriceps* is probably a misprint for *quadrupes*.—(J. W. B.)

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